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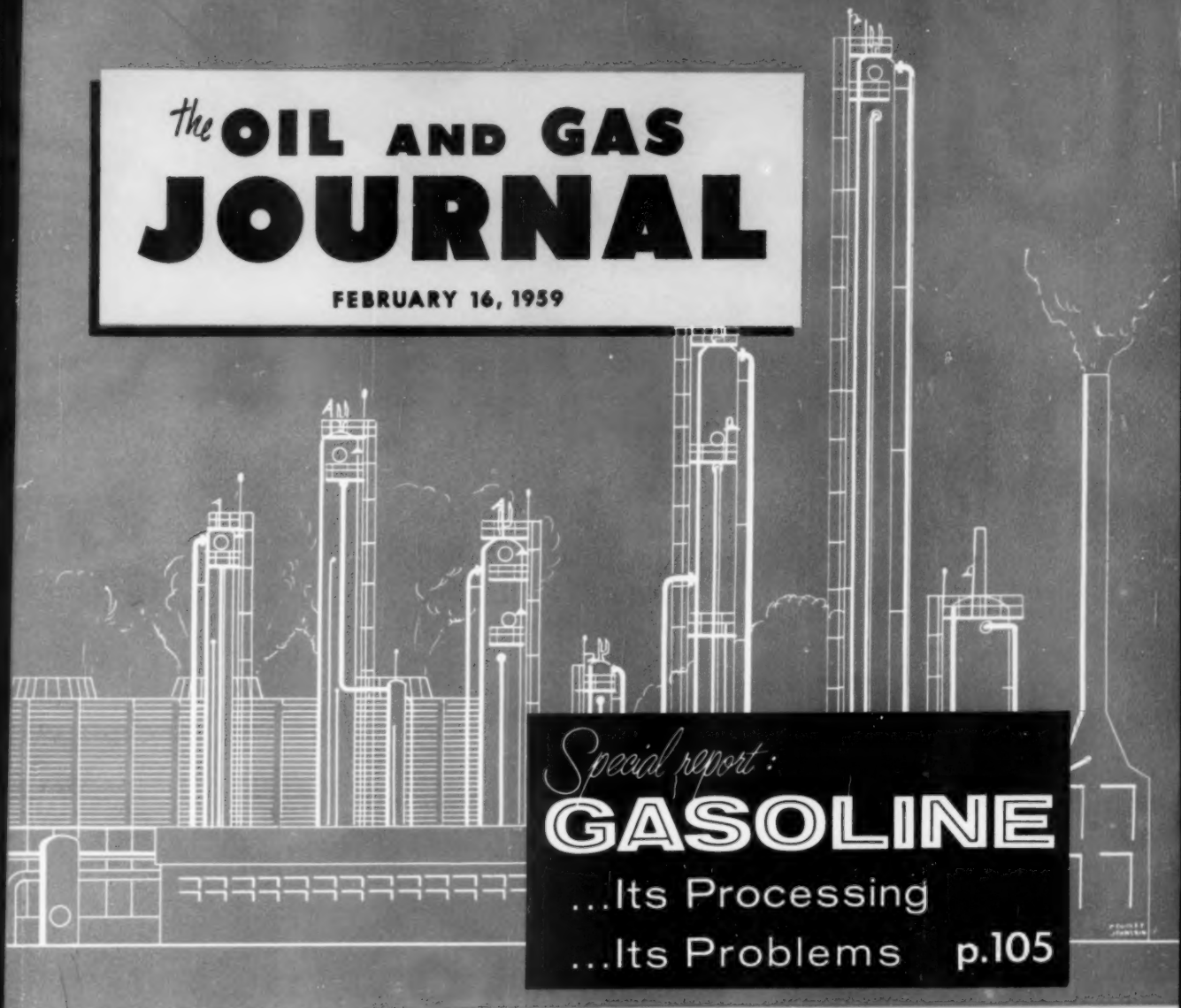
the OIL AND GAS JOURNAL

FEBRUARY 16, 1959



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Study Shows LA Refiners Winning Smog Fight p. 84

This knockout drum, 7 inches thick with 4-inch plate heads, was fabricated in Wyatt's Houston shops for refining service in South America.

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the OIL AND GAS JOURNAL Newsletter

Tulsa, Okla.
Feb. 16, 1959

Oil marketers should note a new threat to gasoline pricing:

Bills before Congress would force refiners to blend 5% alcohol made from surplus farm crops into their motor fuel.

Rep. Jensen, Iowa Republican, and Sen. Mundt, South Dakota Republican, have nearly identical bills in both houses.

They argue: It's only way to reduce tremendous, costly, price-depressing farm surpluses. A 5% alcohol-gasoline blend would consume more than 700 million bushels of grain a year. Jensen says the alcohol could be made for 45 cents a gallon after selling the residue for stock feed.

For refiners, such a compulsory blend would be a costly headache, and for motorists it would mean a sharp price hike.

Take the Gulf Coast where 92-octane gasoline is available now from refiners at 10 cents a gallon.

If 5% of this gasoline were a blend of alcohol costing 45 cents a gallon, the cost would be 2.25 cents a gallon.

The 95% gasoline in the new blend would represent a cost of 9.5 cents a gallon.

The alcohol-gasoline blend thus would cost 11.75 cents a gallon or an increase of 1¼ cents.

But this is not the entire increased cost.

Refiners would have to add freight for moving the alcohol blending stock to their plants and extra expense for storage and setting up a blending operation not tied into their processing scheme.

The bills may die, but they again underscore the constant threat gasoline faces from added taxes and costs over which the oil industry has no control.

▼ ▼ ▼

Active rotary rigs in U. S. finally turned up last week for first time in the new year.

They totaled 1,795, up 14 from week before. The gain was due to a strong pickup in Oklahoma and Kansas drilling. Activity still is 187 below 1958 levels at this time with bulk of the lag in Texas rigs.

On the bright side: Drilling upturn from winter low has occurred about month early this year. And big companies still insist they have not curtailed drilling programs.

A new gage on exploration interest may come at Louisiana lease sale next week.

It's first time in almost 3 years the industry has had a chance to bid on offshore acreage and first time in months that new inland tracts have been available.

Forty-four offshore tracts totaling nearly 100,000 acres lying between shoreline and 3-mile line have been nominated. Even more inland acres are up for bids (p. 82).

Louisiana halted inland lease sales last summer because bidding interest was low.

A real old-fashioned "gusher" blew oil over the West Texas landscape in Crockett County last week.

The Fred Turner 3-BB Shannon, 5 miles southeast of Iraan, blew tools out of the hole with a full stream of oil through 7-in. casing. It blew for 25 hours at an estimated rate of 100,000 bbl. daily.

Owners are not too elated. They term the blow probably a geologic freak. Offset wells are pumping, and dry holes are not too far distant on all sides (Photos in the NEWS, p. 98).

Watch the Lignite and South Rival areas of North Dakota for quick developments.

Lion Oil's 1 Bly, about midway between these two Burke County fields, was completed flowing 506 bbl. daily on 20/64-in. coke from Mississippian.

Lion and Pan American each have half interest in the well and the 320-acre block on which it was drilled.

Northwestern Kansas still looks good.

Phillips reports finding oil at another of its strat tests in the new oil province. Latest discovery prospect is north of the town of Bird City in Cheyenne County, 23 miles north of Llanos field.

Work has stopped on the world's deepest hole.

Phillips plugged the 1-EE University in Pecos County, West Texas, at 25,340 ft.

The well broke the Texas depth record in April 1958 and the world's record in May. It failed to find production but has yielded a store of information on the geological feature known as the Sheffield channel.

Drillers are conquering unusual problems found in the Four Corners area of Utah, Colorado, Arizona, and New Mexico.

Experience has proved that transportation is expensive, tool-joint wear high, water excessively hard, and personnel turnover intense (p. 126).

Improvements, however, include better drilling fluids, new methods of controlling water flows, higher rotary speeds in softer formations, more bit weight while drilling the harder formations.

Use of gas in San Juan basin has proved most economical way of drilling when formation water is not encountered.

▼ ▼ ▼

Union Oil may use New Mexico gas in secondary recovery of oil in California if Transwestern Pipeline is built.

The California company has arranged with the pipeline to move up to 50,000 M.c.f. or more of gas daily from Crawford field in Eddy County, New Mexico, to California border. From there it would move to California oil fields through facilities of Pacific Lighting Gas Supply Co.

Pipeliners will be interested in the design tricks used by Shamrock to reduce capital investment required in building new Amarillo-Albuquerque products line (p. 122).

The design: Small pipe (6-in.) and relatively high pipeline pressures (up to 1,500 psi.). Substantial savings were achieved by using the lightweight, high-pressure pipe both in original cost and also in lower freight, handling, and welding costs.

Three pumping stations allow Shamrock to push 12,500 bbl. of gasoline daily through the line to Tucumcari and 10,500 bbl. daily from Tucumcari to Albuquerque. Capacities can be increased by additional pumping facilities.

▼ ▼ ▼

Tidewater may be cashing in on benefits of excellent new coking facilities at its West Coast refinery.

Company is stepping up production from several heavy-oil fields in California's San Joaquin Valley. It's drilling 53 shallow wells at Kern River, McKittrick, and North Midway. It also is installing 235 bottom-hole heaters to stimulate output from older low-gravity wells.

More important, this activity is coming at a time when most large California companies have top-heavy residual inventories and want only light crudes.

Tidewater's 42,000-bbl. fluid coker at its San Francisco Bay refinery now has established a record run of more than 300 days. Byproduct coke largely is used to generate power for refinery use, further simplifying company's bottom-of-the-barrel problem.

Refineries in Los Angeles are no longer a major source of smog. But it cost the industry $33 million for control devices and other remedies (p. 84).

Study shows that of 1,411 tons of hydrocarbons lost to the atmosphere daily in Los Angeles only 103 tons come from area's 18 refineries.

This is remarkable in view of fact that there are 400,000 individual points in the refineries where pollutants could escape.

Pemex is in the news again these days.

Talk that $40-million pipeline loan has been extended by U.S. banks is heard both in Mexico City and Washington. But so far New York banking circles haven't confirmed reports.

Credit would finance pipeline from Tabasco gas-producing areas to Mexico City. Project is visioned as key to new Pemex expansion program and industrial development of nation.

Loan would have even more significance, however: Would reveal restored confidence of financial men in soundness of Mexico's oil program.

Long-expected shakeup in Pemex following appointment of Industrialist Pascual Gutierrez Roldan as director is now getting started.

Series of newspaper articles by Pemex press chief revealing past waste, inefficiency, and labor corruption in industry kicked off the new program to trim payroll.

The articles drew a counter blast from oil-labor chief, Pedro Vivanco Garcia. He says the new Pemex administration is preparing public opinion for return of foreign ownership of the Mexican oil industry.

▼ ▼ ▼

In oil-company research, the scientists privately report the trend now seems to be on the side of practicality, and at least for the time being away from long-range, pure research.

They blame the trend on the recent recession which forced management attention to strict economy.

What's happening in many instances, these men say, is this:

Research labs are becoming more and more service labs. Projects are preferred which promise to give quick results in improved methods, techniques, or products. Projects of the "long-hair" variety often get shelved or delayed temporarily.

Industry opposition is forming in Texas against proposed 3% tax on dedicated gas reserves.

Texas Mid-Continent Oil and Gas Association has taken a strong public stand opposing levy. Other groups are studying similar action.

Bill has backing of the governor and thus stands better than average chance of passing.

Industry notes: Crude price cuts in West Texas and New Mexico are now unanimous. Gulf, the last major buyer to act, posted the 7-cent cut last week with a 3-cent differential on sour. Gulf's move affected about 210,000 bbl. daily...Tidewater's George Getty predicts the crude-price whittling will end this summer. He blames depressed market on distressed oil which is seeking an outlet...Economy cars are having another good year. Rambler sales in January were 19,818, up 157% from same month last year. Studebaker-Packard delivered 11,100 of its Lark, up 226% over last year.

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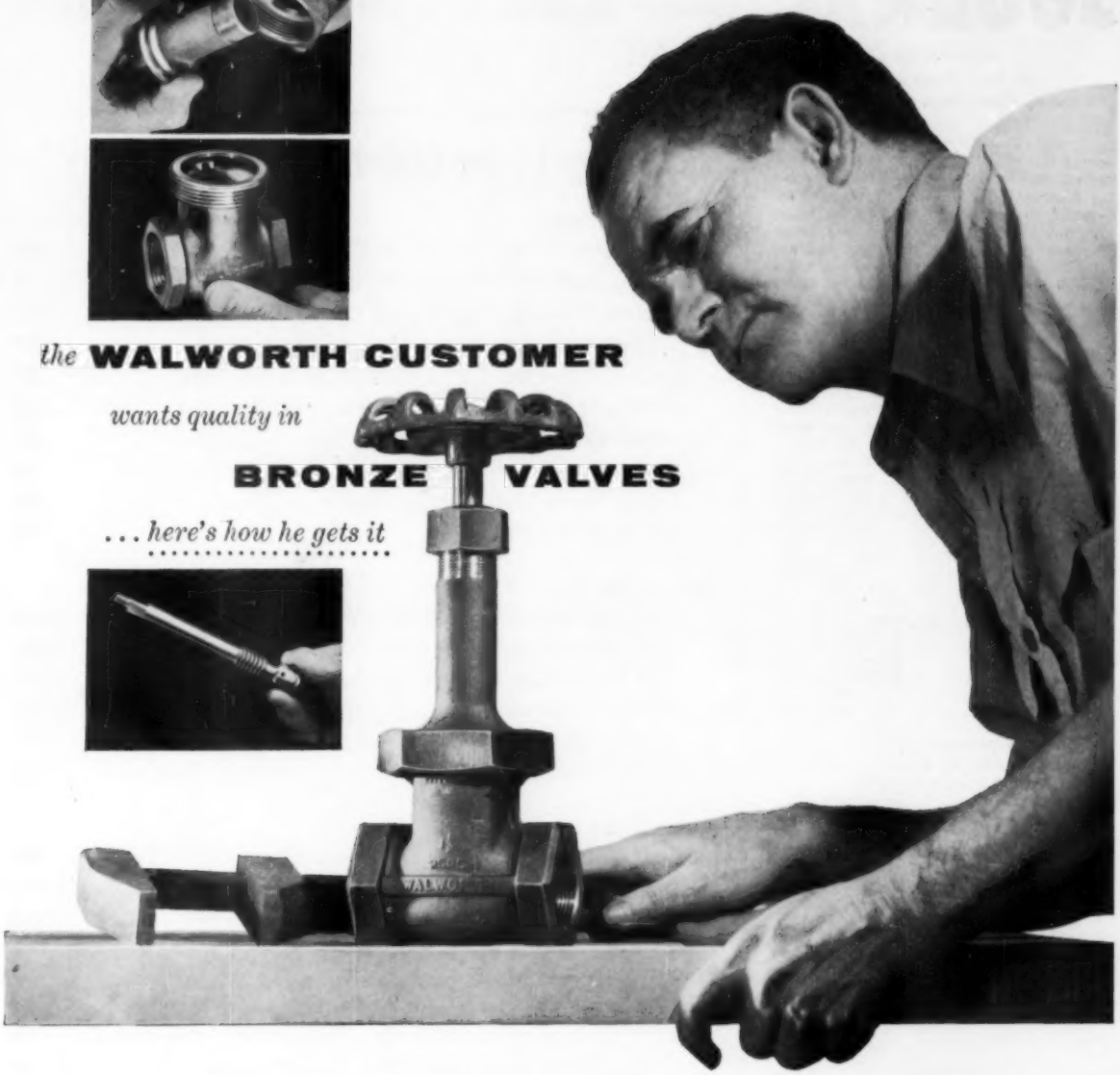

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TECHNOLOGY—OPERATION

Refining-Processing

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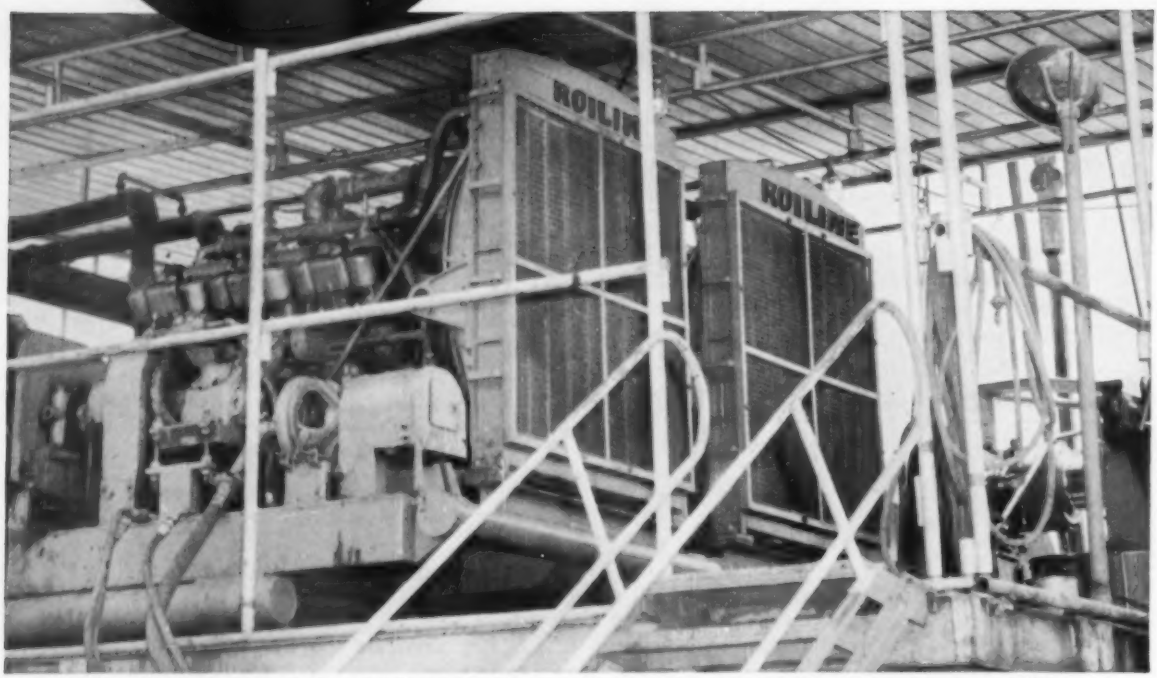

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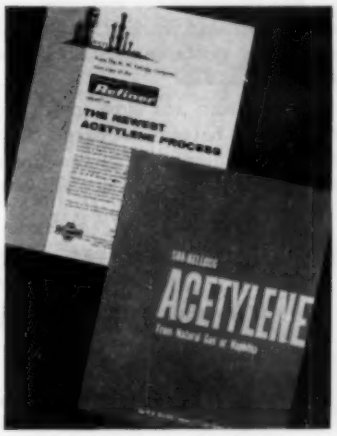

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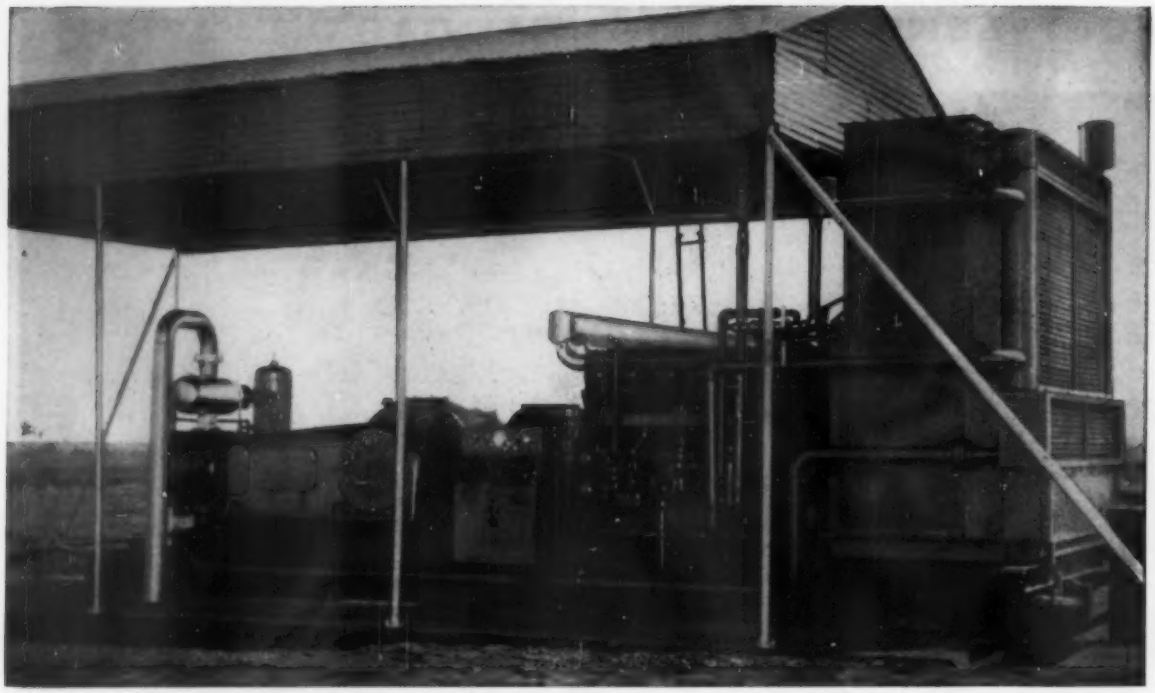

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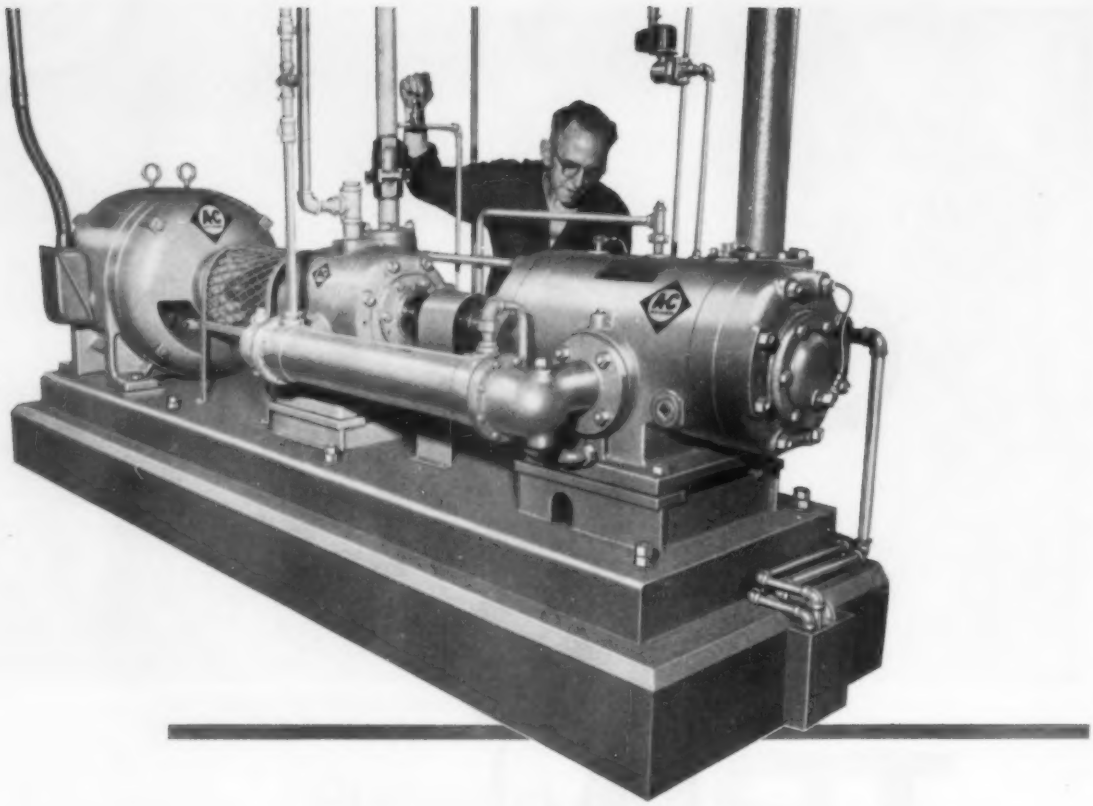
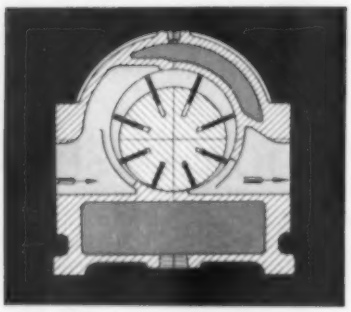
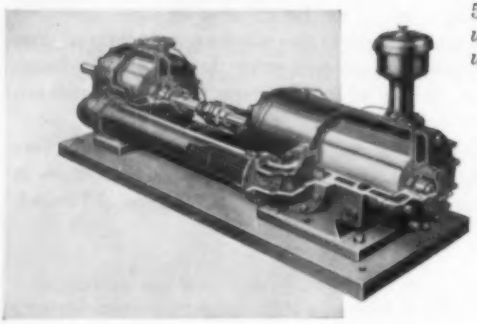


Smooth operation—Prolonged efficiency



Simple operation — centrifugal force holds blades against sidewall to form air chamber.



with Ro-Flo compressors for plant air supply

Rotary operation is smooth, vibrationless. Compare this to the pounding and shock inherent in reciprocating compressors.

That's why *Ro-Flo* compressors eliminate the cost of heavy foundations. A slab is enough. Smaller units are bolted to the floor. And "like-new" efficiency is maintained for years — because rotor blades compensate for wear automatically.

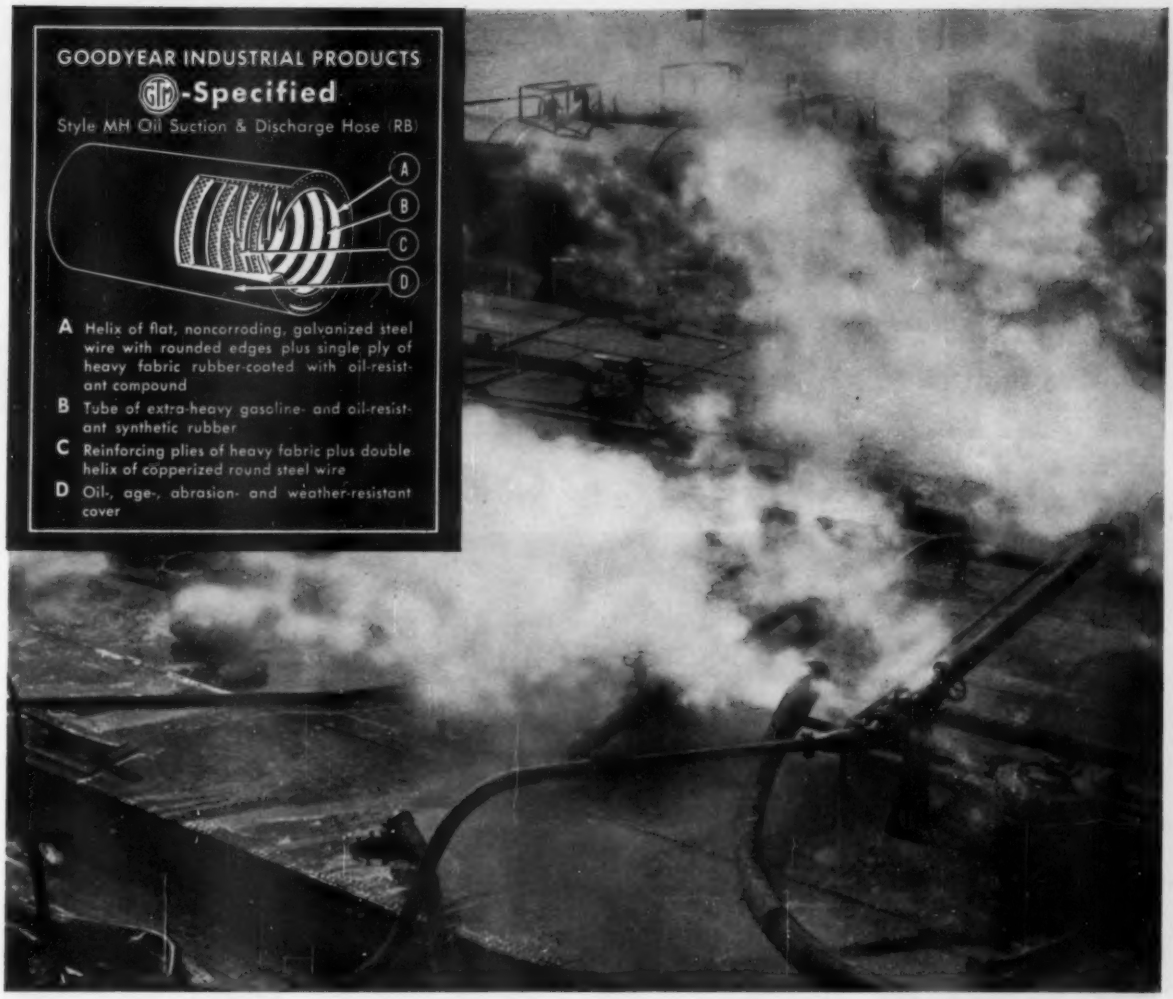
No pistons, valves or connecting rods to cause trouble. Only two wearing parts in the *Ro-Flo* compressor. All this means far less maintenance.

Two-stage units range from 250 to 1800 cfm, from 60 to 125 lb gauge. Single-stage units from 40 to 3000 cfm, up to 50 lb gauge. *Ask your A-C man for descriptive literature, or write Allis-Chalmers, Industrial Equipment Division, Milwaukee 1, Wisconsin.*

Ro-Flo is an Allis-Chalmers trademark.

ALLIS-CHALMERS

A-5899


GOODYEAR INDUSTRIAL PRODUCTS
G.T.M.-Specified
Style MH Oil Suction & Discharge Hose (RB)
A
B
C
D
A Helix of flat, noncorroding, galvanized steel wire with rounded edges plus single ply of heavy fabric rubber-coated with oil-resistant compound
B Tube of extra-heavy gasoline- and oil-resistant synthetic rubber
C Reinforcing plies of heavy fabric plus double helix of copperized round steel wire
D Oil-, age-, abrasion- and weather-resistant cover

12 years of punishing dock work—still asking for more

The tides at this major Southern port are big ones—dropping tankers and barges 13 to 15 feet just while unloading. That subjects hose lines to a lot of *severe* twist and torque. They're constantly dragged over the rough wood and concrete docks. And the throbbing action of high-gallonage pumping adds still more abuse.

But the G.T.M.—Goodyear Technical Man—knew he had the answer to this rugged service in Style MH Suction and Discharge Hose. It's muscled with a rugged double helix of heavy steel wire for top resistance to crushing and kinking. Its super-tough cover shrugs off the most severe abrasion—is oil-, age- and weather-resisting, too.

How did it work? The G.T.M.'s hose *has taken 12 straight years of punishment—is still going strong.* In that time, it's handled gasoline, refined oil, propane, butane and crude oil. And the customer, impressed by its quality, has also ordered Goodyear steam hose for the barge-cleaning operation shown above.

Better, longer-lasting hose for *your* dock? There are over 800 types in the complete Goodyear line. For details on any one of them, contact the G.T.M. through your Goodyear Distributor—or write Goodyear, Industrial Products Division, Akron 16, Ohio.

IT'S SMART TO DO BUSINESS *with your Goodyear Distributor. He can give you fast, dependable service in Hose, V-Belts, Flat Belts and many other industrial rubber and nonrubber supplies. Look for him in the Yellow Pages under "Rubber Goods" or "Rubber Products."*

STYLE MH OIL SUCTION AND DISCHARGE HOSE BY

GOODYEAR

THE GREATEST NAME IN RUBBER

FOR COMPLETE SATISFACTION AND SAFETY

APPLETON

INDUSTRY'S MOST ADVANCED LINE

EXPLOSION-PROOF EQUIPMENT

JUNCTION UNILETS

LIGHTING FIXTURES

RECEPTACLES

Explosion-proof electrical equipment is more important today than ever before. Manufacturers of material handling equipment are adding explosion-proof switches and connectors to be used in hazardous areas. And, an ever increasing number of industrial plants are almost entirely equipped with explosion-proof electrical equipment. Appleton's full line of explosion-proof electrical equipment is the result of extensive laboratory development and field tests, with your individual safety requirements in mind. Proven acceptance and use by leading companies the world over is your assurance that APPLETON is...

TODAY, MORE THAN EVER...

The Standard for Better Wiring®

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LINE STARTER UNILETS

FLEXIBLE COUPLINGS

EXPANSION UNIONS

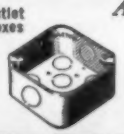
CIRCUIT BREAKER UNILETS

Sold Through Franchised Distributors Only

APPLETON ELECTRIC PRODUCTS®

Industrial Lighting

Outlet Boxes



Also Manufacturers of

"ST" Series Connectors

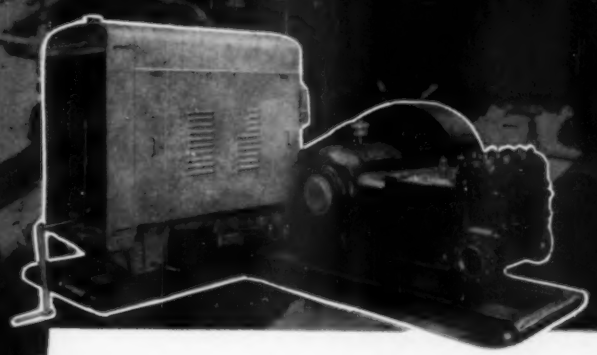
Malleable Iron Unilets & Covers

Automatic Reelites

APPLETON ELECTRIC COMPANY 1704 Wellington Avenue, Chicago 13, Illinois

NO WORRIES HERE

NO QUESTION ABOUT THE PUMPS' DELIVERING CAPACITY PERFORMANCE WITH MINIMUM ATTENTION FOR PERIODS FAR BEYOND THE "NORMAL" LIFE SPAN OF MECHANICAL EQUIPMENT. *THEY'RE GASOS*



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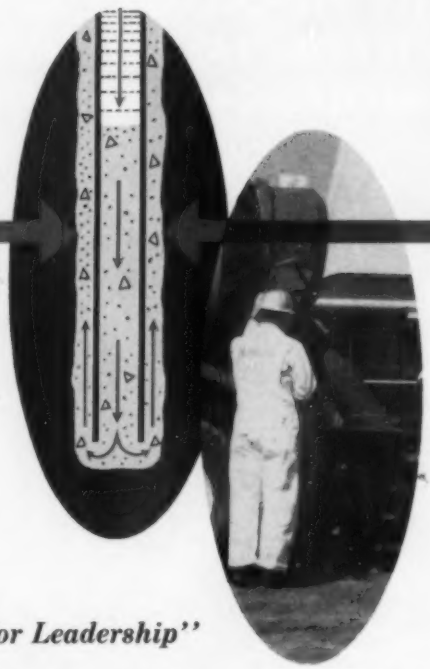
PRODUCTION FUNDAMENTAL!

HALLIBURTON ENGINEERED CEMENTING



Halliburton Cementing Services provide you with experience, dependability, quality of product and tools, the industry's most modern service equipment, research developed techniques, and men of reliability. These are the Halliburton fundamentals that aid in the production of your well.

Your selection of Halliburton *engineered cementing* gives your well the maximum service that modern technology offers.

"Continue To Look To Halliburton – For Leadership"

HALLIBURTON *NON-WELD* LIMITING DEVICES . . . economy plus dependability

VISE-LOK LIMIT CLAMP

Hinged for easy installation, this new self-tightening clamp with record-carrying capacity of loads up to 20,000 lbs., has superior lock-on power which eliminates welding—prevents damage to casing. Limits movement of casing centralizers, cement basket, and reciprocating cleaners. Especially designed to install new type Halliburton Roto Wall Cleaners with special slotted flat center and ends.

SOLID SET SCREW LIMIT RING

Load-carrying capacity up to 14,000 lbs., surpassing other non-weld limiting devices and stop collars in actual application. Controls movement of accessory equipment installed on casing without welding lugs or rings.

SPLIT DENT LIMIT RING (Welded Type)

One set of two Split Dent Limit Rings is furnished with each Halliburton Centralizer, Cement Basket, and Recipo Wall Cleaner —at no additional cost. Generally restricted to casing that lends itself to welding; either by tack or bead welding.

HALLIBURTON CASING CENTRALIZERS . . . Best That The Industry Provides!

"S-3" CENTRALIZERS

Torture tests show that fewer "S-3" Centralizers are needed to provide maximum centering . . . more spring deflection and less permanent set compared to competitive types. Provide performance and economy that give better results for less money. Designed with heat-treated steel springs lap-welded to hinge-type end bands, "S-3s" cover more sidewall area, are less likely to damage side of hole from dropping into vertical crevices. The "S-3" requires no "on-the-job" adjustment. All standard hole sizes for any given casing ranging from 4" O.D. to 24" O.D. are available, providing ease of ordering, storing, and transferring from one job to another.

Get ALL These Advantages with Halliburton "S-3" Casing Centralizers:

- more uniform annulus around casing
- more even distribution of cement around casing
- better bond of cement between casing and formation
- helps prevent cement channeling
- no clutching or gripping of casing while rotating
- better protection from sidewall damage
- minimizes costly remedial work
- prolongs effective well life
- aids in better over-all well completion

"SLIM-HOLE" CENTRALIZERS

Provide more positive centering of casing or liners in a small annulus area . . . positive (non-flexible) type pre-formed springs are tailored for specific slim hole sizes. Spring deflection is eliminated, enabling "Slim-Hole" Centralizers to maintain an accurate O.D. size. Hinged-type end bands allow easy installation . . . ample clearance between casing and end bands minimizes drag on rotating casing. Longer contact area with sidewall or casing (when run on liners) is provided by the flat pre-formed springs to make a maximum unobstructed and positive annular space. Available in 3½" O.D. Liner through 9⅝" O.D. casing sizes.

"SLIM-HOLE" CENTRALIZERS

"TUBING" CENTRALIZERS

Used on strings in deep wells for better protection to tubing when string is frequently pulled and re-run . . . where tubing is used as production string or in water injection wells while cementing. Provide excellent centering in bore hole to allow better placement of cement. Protect flow valve in gas lift wells.

Tubing Centralizer is same design and overall length as "S-3" Centralizer with springs of same material, heat-treated for maximum centering power and hinged for easy installation. Available in 2" EUE through 3½" EUE tubing sizes.

"TUBING" CENTRALIZERS

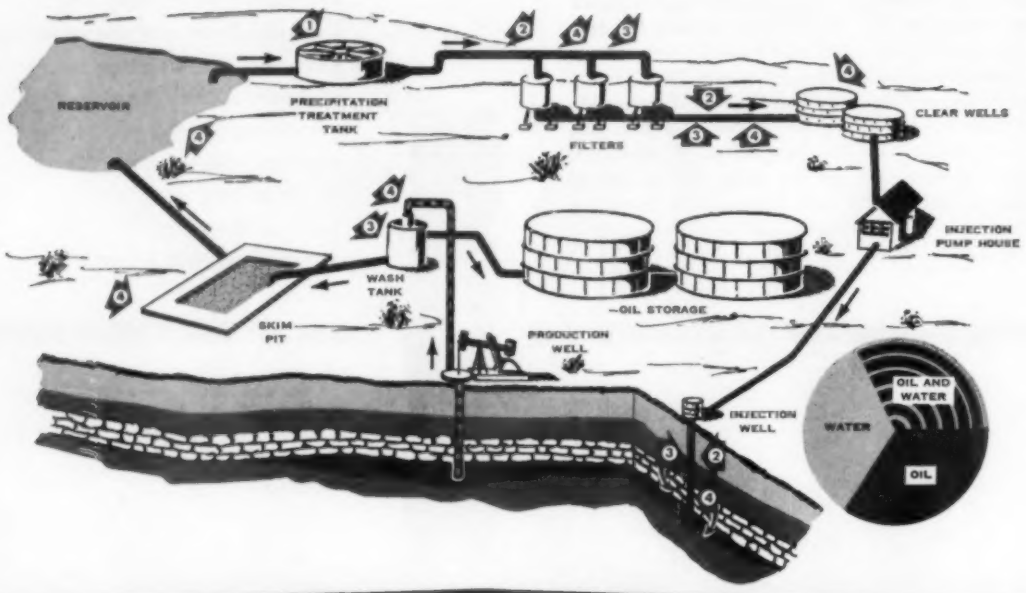
"There is a Halliburton Casing Centralizer designed to provide positive centering in every well."

HALLIBURTON CEMENTING SERVICES

HALLIBURTON OIL WELL CEMENTING COMPANY • DUNCAN, OKLAHOMA

284 SERVICE CENTERS – JUST MINUTES AWAY FROM YOUR WELLS

Continuous High Input with *Visco*® Water Flood Treatments



1 TURBIDITY REMOVAL
Clarification of raw water with efficient coagulants assures better floc formation, faster settling of solids.

2 CORROSION CONTROL
Polyphosphates or organic film forming inhibitors protect pipe lines and equipment against corrosive attack.

3 SCALE PREVENTION
Stabilizing treatments keep scale-forming salts in solution and maintain clean lines and an open formation with large water input volume.

4 MICROBIOLOGICAL CONTROL
Microbiological treatments help maintain clean equipment and an open formation by controlling slime, algae and sulfate reducing bacteria.

Treatments for water flood operations add up to continuous high input, low pumping costs, elimination of acidizing and back flushing and lower over-all operating and maintenance costs. Check the diagram above for points where the Visco Chemicals and Services work to improve water flood efficiency . . . Your Visco Field Service Man will be glad to work with you on any problems you have. His experience is backed by the entire facilities and skills of the world's largest water treatment organization.

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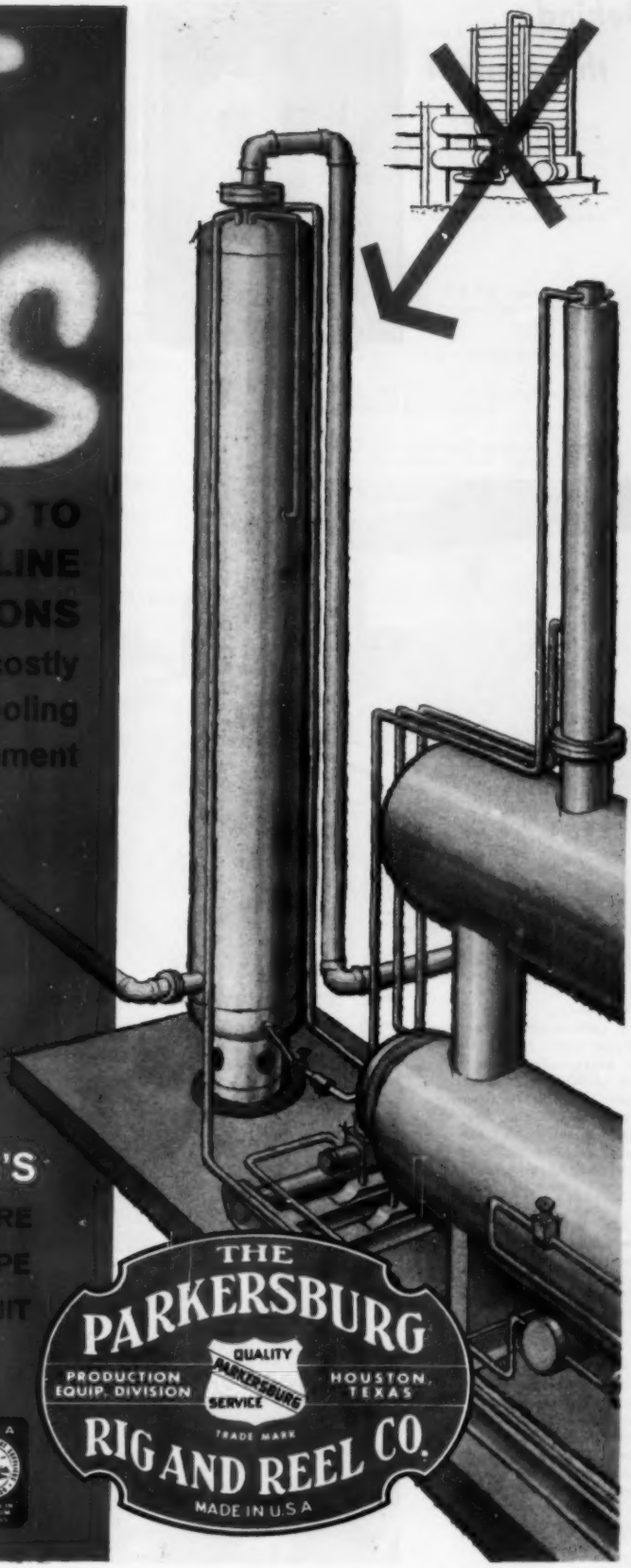
Visco® CONSISTENTLY EFFICIENT OIL INDUSTRY CHEMICALS

HOT GAS

DEHYDRATED TO PIPELINE SPECIFICATIONS without costly after-cooling equipment

BY PARKERSBURG'S EXCLUSIVE HI-TEMPERATURE SUPER DRYER GLYCOL-TYPE DEHYDRATION UNIT



THE PARKERSBURG RIG AND REEL CO.

PRODUCTION EQUIP. DIVISION — QUALITY PARKERSBURG SERVICE — HOUSTON, TEXAS

TRADE MARK

MADE IN U.S.A.

PESA

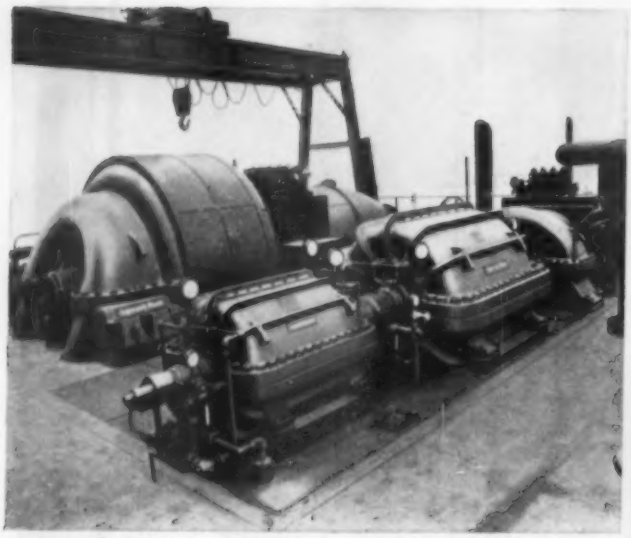
PARTNERS IN PETROLEUM PROGRESS

Behind this symbol

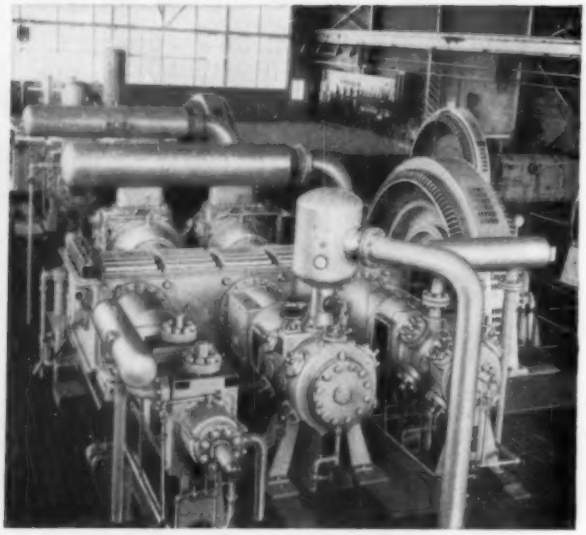
...a century of service

Here's what it means to

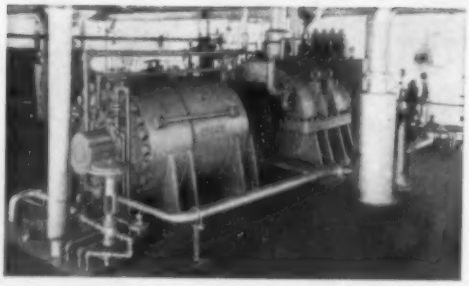
REFINERY and PETROCHEMICAL MEN...



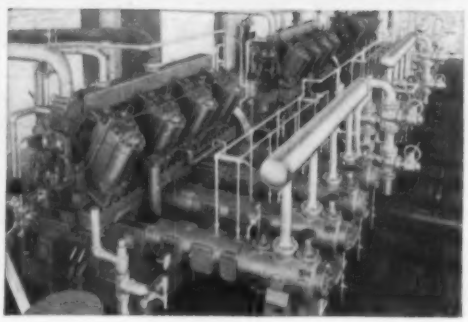
I-R cat-cracking Turbo-Blower rated 122,700 cfm (in background), and two I-R centrifugal compressors in series-tandem rated 20,800 cfm. They are powered by I-R steam turbines, rated 10,000 hp and 6500 hp respectively.



This ammonia synthesis plant has nine multi-stage HHE process compressors totalling 15,100 hp. I-R electric-driven reciprocating compressors range from ½ to 7500 hp.



This Ingersoll-Rand vertically-split centrifugal compressor, handling hydrogen at 675 psi, is driven by an I-R steam turbine rated 5500 hp.



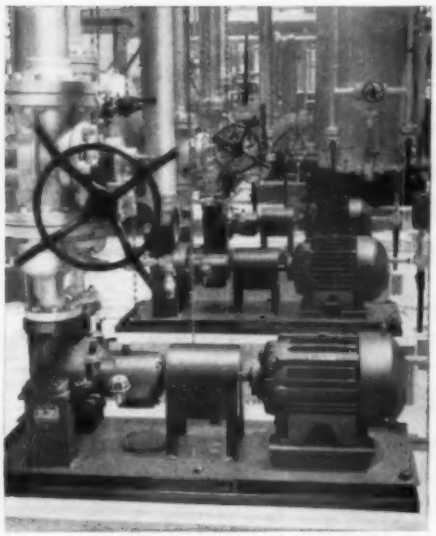
Three 440-hp SVG-NL gas-engine compressors with non-lubricated compressor cylinders recycling hydrogen. Ingersoll-Rand builds 4-cycle, V-angle engine-compressors from 120 to 2000 hp.

Compressors for every job

Ingersoll-Rand has the world's most comprehensive compressor experience, and builds reciprocating, centrifugal, rotary and jet types in all sizes. Reciprocating units are available in sizes for ½ to 7500 hp, for pressures from vacuums to 35,000 psi. Centrifugal compressors and Turbo-Blowers are offered for pressures to 5000 psi and higher, and capacities to 400,000 cfm. I-R also builds steam turbines to 20,000 hp and higher for a wide range of steam conditions and speeds.

to the oil industry:

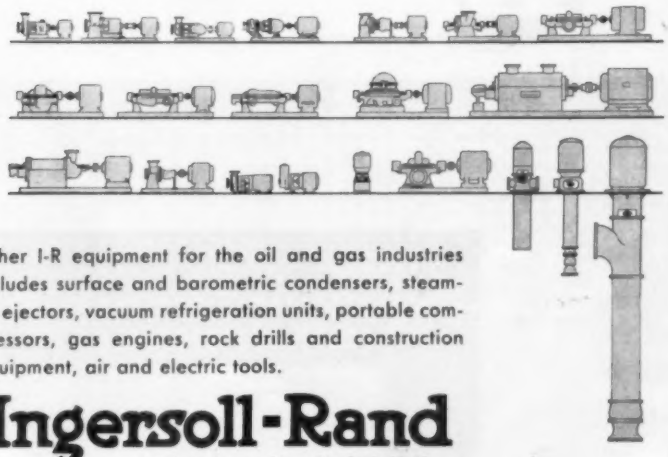
Soon after Colonel Drake discovered oil at Titusville, the history of Ingersoll-Rand began with the manufacture of Cameron reciprocating steam pumps. A few years later, other I-R "ancestor" companies began building compressors and rock drills. Ever since that time Ingersoll-Rand has been growing with the oil and gas industries. Today I-R provides the widest range of compressors, pumps and other equipment for the production, transmission, and processing of oil and gas and their products—the I-R monogram is more than ever a symbol of leadership and progress.



Centrifugal pumps for every service

Ingersoll-Rand offers the most complete line of centrifugal pumps available from any single manufacturer (capacities to 140,000 gpm, total heads to 6500 ft., sizes to 23,000 hp.) There is a size and type to meet the exact requirements of any process application to best advantage. Sustained high efficiency and maximum interchangeability of parts contribute to low operating and maintenance costs.

Photo shows three vertically-split process pumps on debutanizer service. Below are a few of the hundreds of types and sizes of centrifugal pumps built by Ingersoll-Rand.

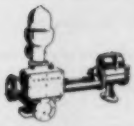


Other I-R equipment for the oil and gas industries includes surface and barometric condensers, steam-jet ejectors, vacuum refrigeration units, portable compressors, gas engines, rock drills and construction equipment, air and electric tools.

Ingersoll-Rand

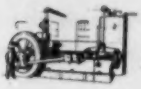
14-883 11 Broadway, New York 4, N.Y.

I-R MILESTONES OF PROGRESS
have had a far-reaching effect on the petroleum industry



1860 The first Cameron pump—a reciprocating steam pump which found wide use in the petroleum industry.

1871 Simon Ingersoll's steam-powered rock drill.



1872 Heavy-duty reciprocating compressors.

1902 The first portable compressor.

1906 The first direct-connected synchronous-motor-driven compressor.

1912 First centrifugal compressor for 90-psi air, and powered by I-R turbine.

1913 Centrifugal pump.

1920 Oil-engine compressor engineered as a unit; solid fuel injection.

1924 Large 4500-psi compressors for ammonia synthesis (still operating).

1927 Centrifugal pipeline pump; mechanical shaft seal.

1928 Barrel-type hot-oil charging pump for refineries.

1930 First compressor for 15,000 psi on commercial scale.

1931 Close-coupled Motorpump.

1931 First centrifugal gas pipeline compressor, "canned" with 3000-hp motor.

1933 Famous XVG gas-engine compressors combined multiple power cylinders and compressor cylinders on single frame.

1933 First non-lubricated compressors.

1935 Channel Valves set new standards for compressor valving, unmatched to this day.

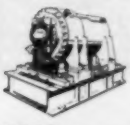
1937 Complete line of vertically-split centrifugal process pumps.

1940 First fluid cat-cracker main air blower.

1947 First high-pressure centrifugal compressor for gas transmission.

1949 First centrifugal gas compressor for cat-cracking.

1952 First turbo-charged gas-engine compressor, the 2000-hp KVS.



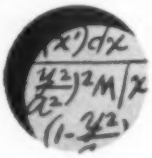
1954 First centrifugal compressor for 2000 psi.

1955 Compressor built for 35,000 psi on commercial scale.

1958 Highest-pressure centrifugal pump—6500 psi.

In engineered products, there's no substitute for experience

· pinboard programming: easy as putting a round peg in a round hole



Simplified pinboard programming of the Burroughs E101 electronic digital computer multiplies technical talent. Scientific personnel report time savings of 20 to 1 over manual calculators. Ease of operation makes practical the "open shop" computer approach, with extensive savings of high-priced man hours in scores of installations. Optional input-output units for punched paper tape and punched cards further extend data-handling / problem-solving capacity. From small computers to giant data processing systems, Burroughs equipment means new efficiency...and profits...for you. Write for E101 Brochure today. ElectroData Division, Pasadena, California.

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"NEW DIMENSIONS / in electronics and data processing systems"

Because we at McKee-Raymond handle the complete design, engineering, and construction of overseas chemical or petroleum refineries, we refer to them as "package projects." And when you see the time, effort and money the McKee-Raymond working team can save you, you'll know what we mean by "large economy."

For example, we have over a century of experience in working in the far corners of the globe. We know the labor situation in Nairobi . . . how to get a rig over the Andes . . . when to beware of the simoon blowing across Arabia.

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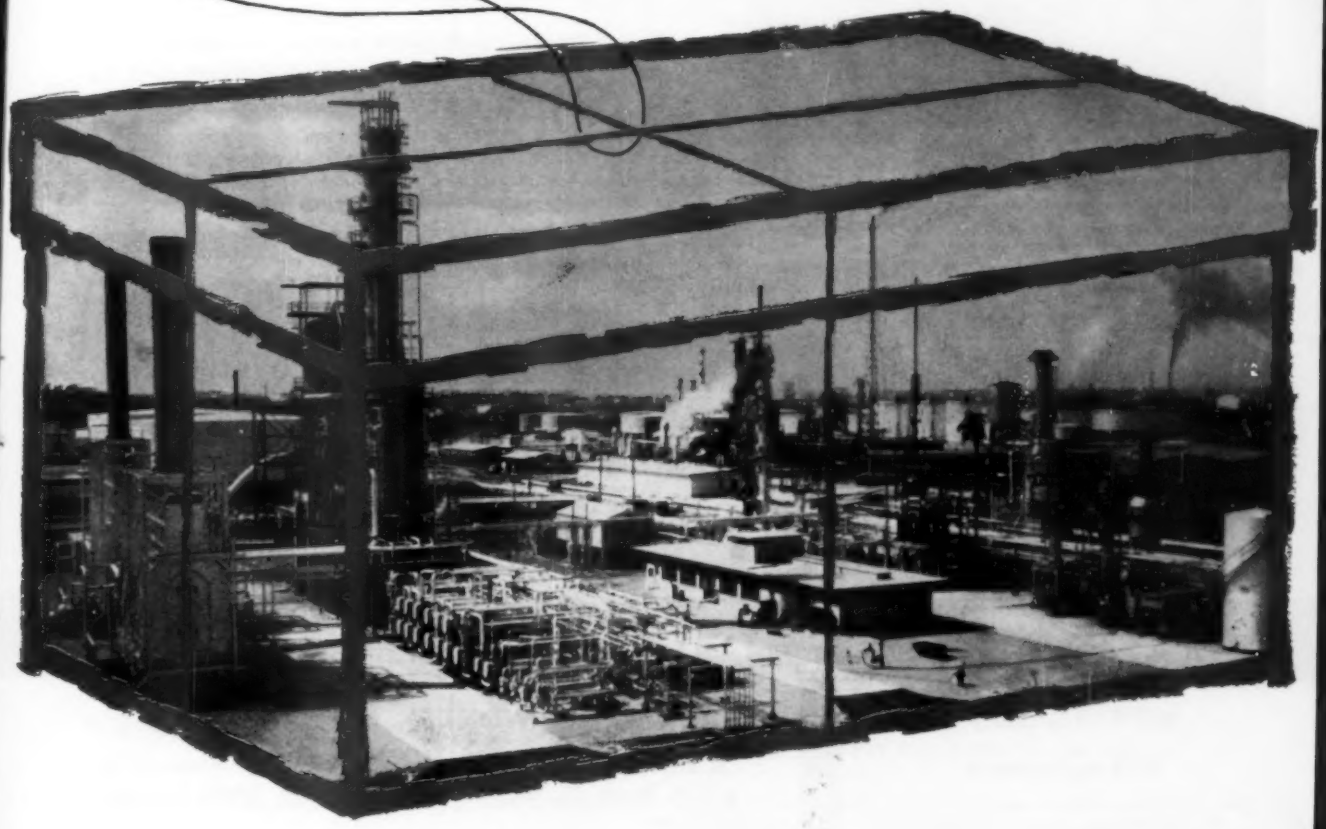
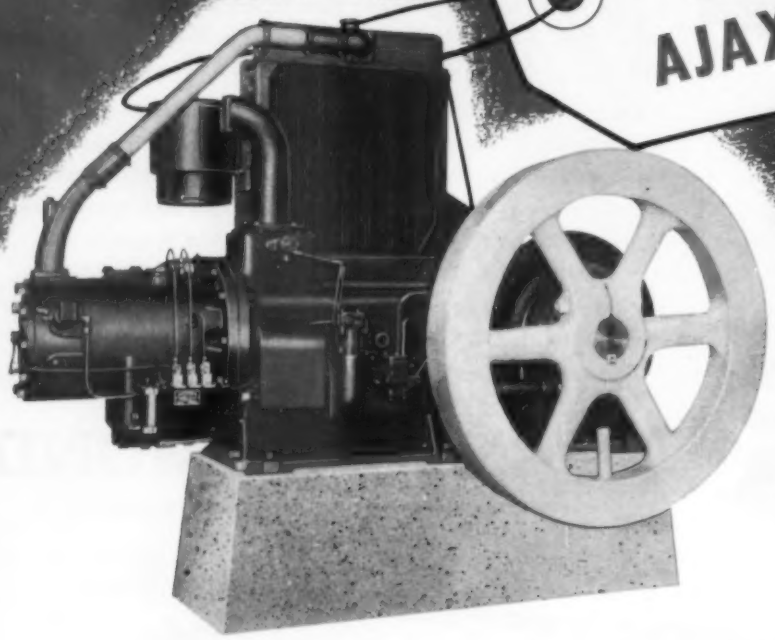
OVERSEAS ENGINEERING AND CONSTRUCTION SERVICES



The purchase price is NOT the cost!

AJAX OFFERS THE LOWEST ULTIMATE COST



DP-60, 9½" bore, 12" stroke. Recommended speed range 300 to 475. Rated BHP 60 at 475 RPM. Overall length 96½". Overall width 64¼". Total weight 6200#.

Thru-out oil land the smooth true running Ajax flywheels symbolize the cheapest and most dependable long life power in the oil producing business.

Simplicity in design — Finest craftsmanship in building — Best possible materials — add up to the lowest ultimate cost.

Horsepower with the broadest range of engine capacities for the greatest number of applications in the field . . . eight sizes, 12 to 115 useable HP.

Yes, they cost a little more . . . but the bonus features give more horsepower per dollar for a longer time. Many AJAX units have run 10 years and longer without even cylinder head removal.

AJAX

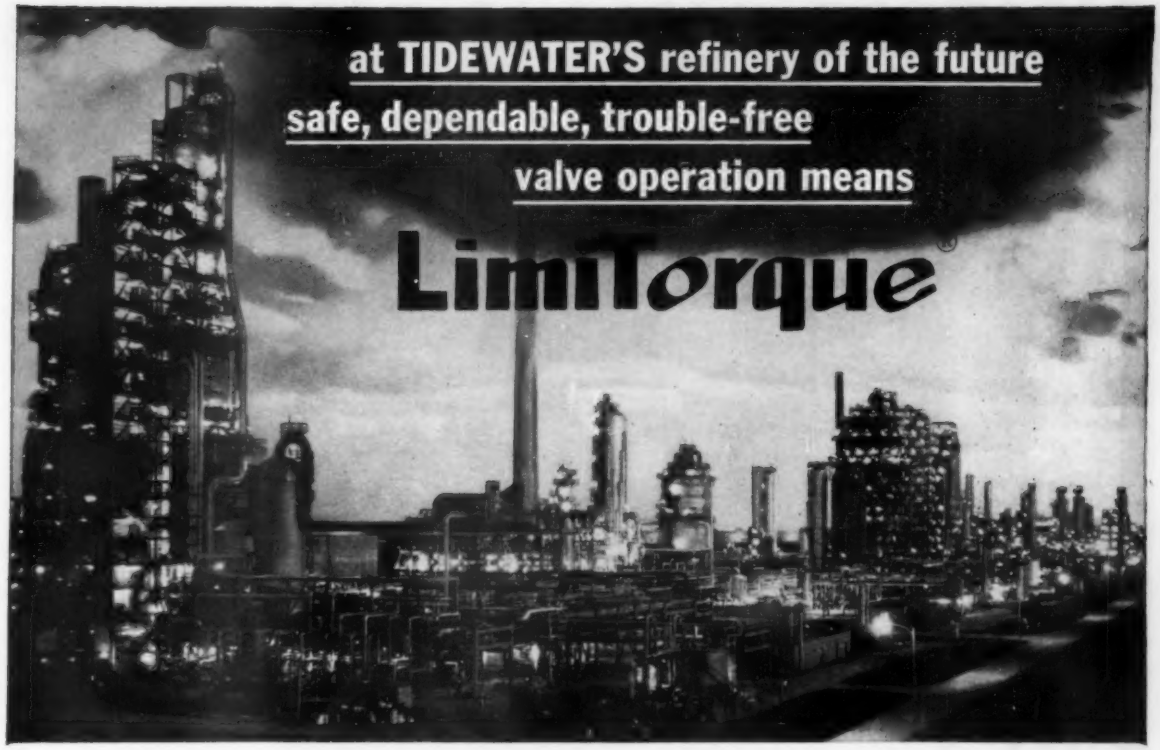
AJAX GAS AND OIL ENGINES

AJAX also builders of

Pressure Pumps Compressors

AJAX IRON WORKS CORRY, PENNSYLVANIA

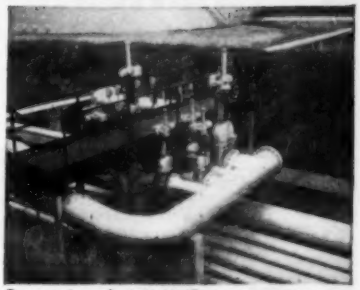
OIL FIELD DISTRIBUTORS: The National Supply Co., Pittsburgh, Pa. • R. B. Moore Co., Bolivar, N. Y. • Bethlehem Supply Co., Tulsa, Oklahoma



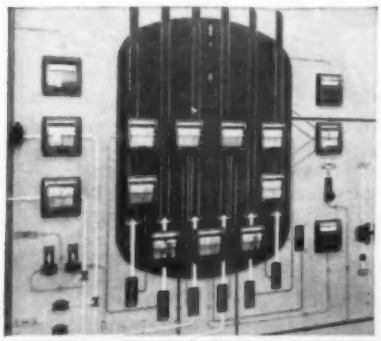
Here, at the World's newest and finest refinery where equipment standards are high . . . technology far advanced . . . six LimiTorque type S3 valve operators at the base of the big "cat", recycle catalysts around the clock . . . help maintain throughput capacity of 102,000 BPD.

In fact, in the refinery section alone 134 LimiTorque Motorized Controls provide safe, automatic, trouble-free valve operation. LimiTorque is more than proud to have played a part in this tribute to American ingenuity.

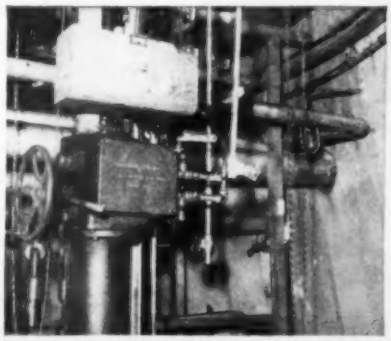
Wherever automatic, remote valve operation is required, LimiTorque will provide rapid, precise control under a wide range of operating conditions. Actuated by electricity, hydraulic pressure, air, or high pressure gas, LimiTorque can be readily field mounted on existing valves. For specific applications, contact your valve manufacturer or nearest LimiTorque representative.



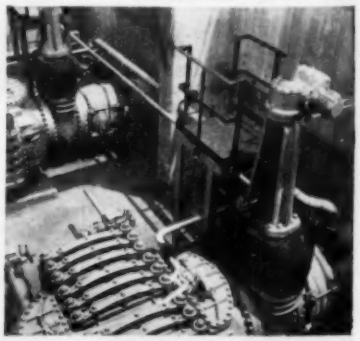
One section of eight LimiTorque operators controlling flow of crude oil to and from tank farm.



Automatic control panel for LimiTorque operated plug valves at base of cat cracker.



One of six LimiTorque S-3 specials regenerating catalysts at base of huge orthoflow fluid cat cracker.



LimiTorque motorized valve controls operate 36 in. valves on ten giant twin strainers.

THERE IS NO SUBSTITUTE FOR

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Offices in all Principal Cities

INDUSTRIAL GEARS & SPEED REDUCERS • LIMITORQUE VALVE CONTROLS • FLUID AGITATORS • FLEXIBLE COUPLINGS
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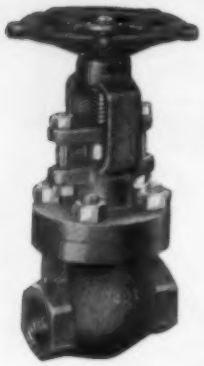

150-800 POUNDS SERVICE
2000 POUNDS COLD, W.O.G.
SIZES ¼" THRU 2"

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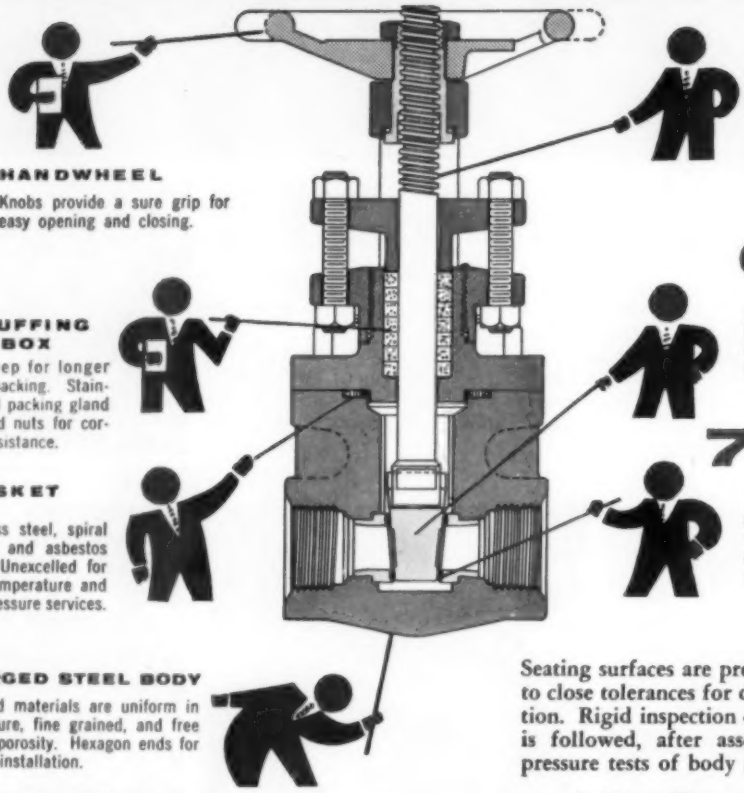
ROUND BOLTED BONNET, BOLTED GLAND

FORGED STEEL GATE VALVE

with 7 superior features



1 HANDWHEEL

Knobs provide a sure grip for easy opening and closing.

2 STUFFING BOX

Extra deep for longer life of packing. Stainless steel packing gland studs and nuts for corrosion resistance.

3 GASKET

Stainless steel, spiral wound, and asbestos filled. Unexcelled for high temperature and high pressure services.

4 FORGED STEEL BODY

Forged materials are uniform in structure, fine grained, and free from porosity. Hexagon ends for easy installation.

5 STEM

13% Chrome stainless steel. A special high melting point alloy yoke nut assures prolonged wear resistance.

6 WEDGE

13% Chrome stainless steel of approximately 500 Brinell for longer wear.

7 SEATS

13% Chrome stainless steel, hard faced with *HAYNES STELLITE or equivalent for stubborn resistance to seat wear.

Seating surfaces are precision machined to close tolerances for drop tight operation. Rigid inspection of finished parts is followed, after assembly, by final pressure tests of body and seats.

Address Dept. 24A-FO.

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Vogt GENERAL GP PURPOSE Vogt FOR BETTER VALVES

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SALES OFFICES: New York, Chicago, Cleveland, Dallas, Camden, N. J., St. Louis, Charleston, W. Va., Cincinnati.

FORGED STEEL

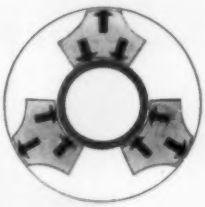
VALVES

DEPENDABLE - DURABLE - PORTABLE

Guiberson's Type H Tubing Spider

for medium and shallow wells

Optional plain gate



Slips make 3-point contact with bowl and tubing — give a smooth, tight grip without crushing the tubing or sticking in the bowl.

Here's a tubing spider so easy to operate you can release it with a single hand or foot, leaving hands free for other work — designed so one man can carry it — yet so rugged and husky it does a job on medium or shallow wells.

Perfectly balanced slips, with segment-insert teeth, make running tubing almost a pleasure with the Type H. Teeth prevent rotation of tubing either way — no need for back-ups. The Type H spider is equipped with a guard gate to prevent damage to slips by elevator. Plain gate, still lighter in weight, is optional at same price.

Crews tell us that they like the Type H tubing spider's new light weight — like its smooth, fast operation — like its segment teeth. The full set of 12 segments is replaceable on the job, at about the same cost as resharpening conventional slips. And speaking of price, there's a lot more value in this spider than its low cost would suggest!

Get the Best — Get Guiberson.

SAVE-THAN SORRY BETTER BE SAFE — GUIBERSON

THE

GUIBERSON

CORPORATION

ESTABLISHED 1919
DALLAS, TEXAS
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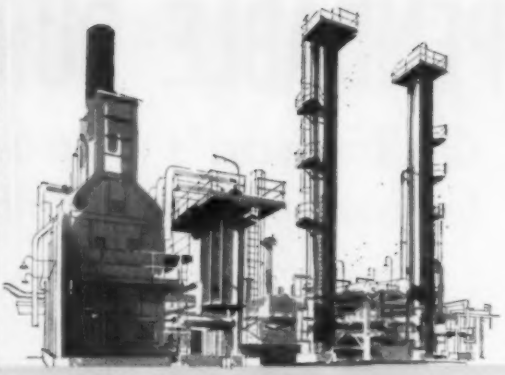
ONE OF THE DRESSER INDUSTRIES

Sold by
Oil Field Supply Stores
Everywhere

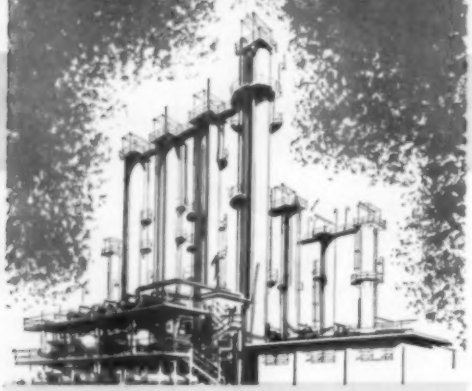
Now any refiner can process any crude he wants...



PLATFORMING® produces
high octane gasolines, high purity aromatics

HF ALKYLATION
makes alkylate, top anti-rumble motor fuel

other

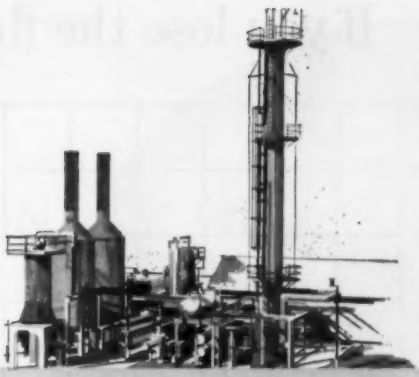


UDEX® the ideal process for
separation of super-purity aromatics

Never before could the petroleum refiner accomplish what he can today. Regardless of the sources and nature of his crude supply—or the kind of petroleum or petrochemical products he wishes to produce—Universal can furnish invaluable aid in helping achieve his objectives.

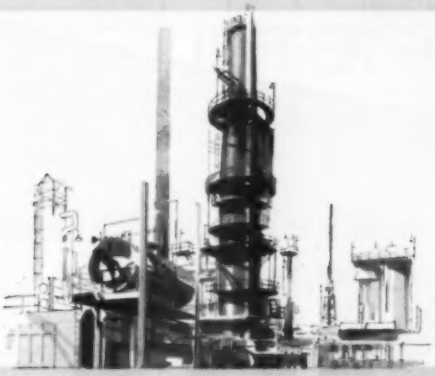
From its nineteen different processes currently available, Universal is in an unparalleled position to provide you with technical knowhow. From analysis of product and market potentials and evaluation of crude supplies through to process design, engineering, operator training and field and laboratory service, UOP is equipped and ready to work with you every step of the way.

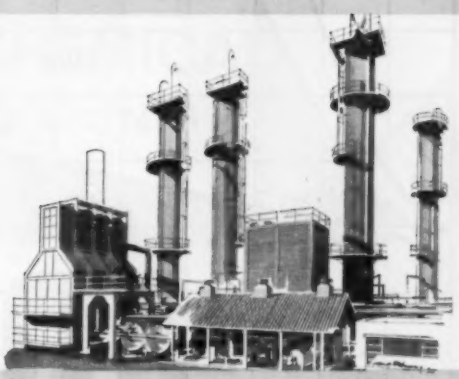
Write for information. Consultation is invited on any processing problem.



BUTAMER* a new and practical process for producing isobutane

UNIFINING* a modern process that completely purifies petroleum distillates





FLUID CATALYTIC CRACKING an improved process that gives higher yields, higher octane numbers

PENEX* new process converting light, normal paraffins to isoparaffins

processes available from UOP

REXFORMING®
the ideal process to insure your top octane position

UNISOL®
a safe and economical process for low-cost gasoline finishing

VACUUM DISTILLATION and VISBREAKING
simple, easy to operate processes for preparation of feed stocks for catalytic cracking

L.P. COKING
permits adjustment of gasoline-to-heavy oils production ratio to meet market needs

THERMAL CRACKING
two-coil selective process, handles wide range of charging stocks

CATALYTIC CONDENSATION
converts olefin fractions of refinery gas into high-quality gasoline and petrochemicals

OLEFIN EXTRACTION
efficiently separates olefins and diolefins from paraffins. Also prepares olefins for further conversion

CATALYTIC DEHYDROGENATION
removes hydrogen from hydrocarbons to produce less saturated hydrocarbons

HYDRAR*
converts benzene to cyclohexane with excellent yields. Extreme high purity achieved with Udex grade benzene

ARGOSORB
removes heavier aromatics from synthetic and natural distillates, produces aromatic-free heavier distillates

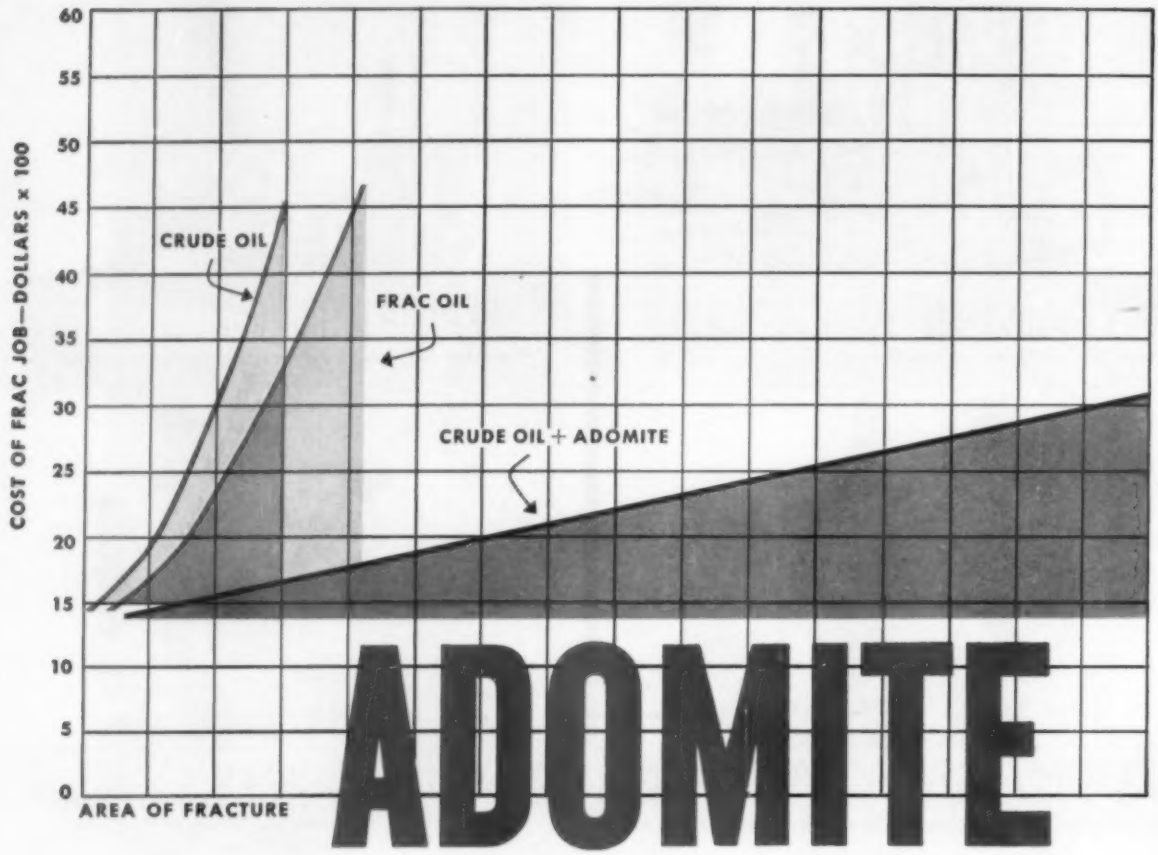
ALKAR*
produces ethylbenzene, cumene and other alkylated aromatics from Fluid Catalytic Cracker off-gas streams

SULFURIC ACID ALKYLATION
produces alkylate, blending component for high-octane gasoline

*TRADEMARKS

UNIVERSAL OIL PRODUCTS COMPANY
30 ALGONQUIN ROAD, DES PLAINES, ILLINOIS, U.S.A.
More Than Forty Years Of Leadership In Petroleum Refining Technology

If you lose the fluid you're losing money!



ADOMITE

stops fluid loss, gives more fracture at lower costs!

In job after job, producers find ADOMITE is the answer to larger fractures, lower costs per area, and greater yields. As the chart above illustrates, ADOMITE stops fluid loss, giving you more fracture extension. This is the kind of dollar-and-cents value economy-minded producers look for. The larger areas fractured could not have been obtained without ADOMITE in the fracturing fluid. Remember . . . fluid *lost* in the formation does *not* extend the fracture. In order to maintain *effective* working fluid, you need ADOMITE.

Why not find out what ADOMITE can mean to you? We'll be glad to perform fluid-loss control tests in your area to show you how to get the most from your fracturing fluid. For your next fracture or refracture job, specify ADOMITE through your service company.

For more detailed information, contact the ADOMITE man in your area.

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Phone 723-8181

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Porter 3-9271

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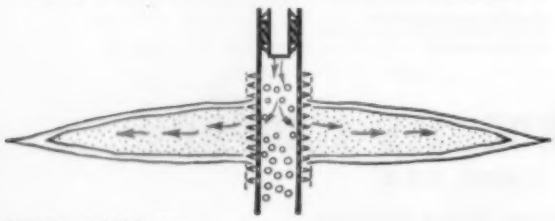
Broadway 3-5653



ADOMITE®

. . . the additive for fracturing

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Whatever your applications in natural gas sweetening, refinery stream sweetening, sulfur recovery, gas dehydration, and carbon dioxide absorption . . . Jefferson Chemical has the right products in the special grades and quantity you desire.

You may utilize the most convenient size shipment and carrier for your production and storage needs . . . single-product or compartmented tank cars of 4,000- to 10,000-gallon capacity, single-product or compartmented tank wagons of 1,000 to 4,000 gallons, or 55-gallon drums.

Combine these high purity chemicals and prompt, accurate shipments with Jefferson's experience and complete willingness to render every possible technical assistance, and you have a first-rate source for your "Gas-Scrubbing" needs. Ask your Jefferson man at 1121 Walker Avenue, Houston 2, Texas.

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CHARLOTTE • LOS ANGELES

Ethylene Oxide, Glycols, Dichloride • Ethanolamines • Morpholine • Piperazine
Polyethylene Glycols • Nonyl Phenol • SURFONIC® Surface-Active Agents
Ethylene Carbonate and Propylene Carbonate • Caustic Potash • Caustic Soda
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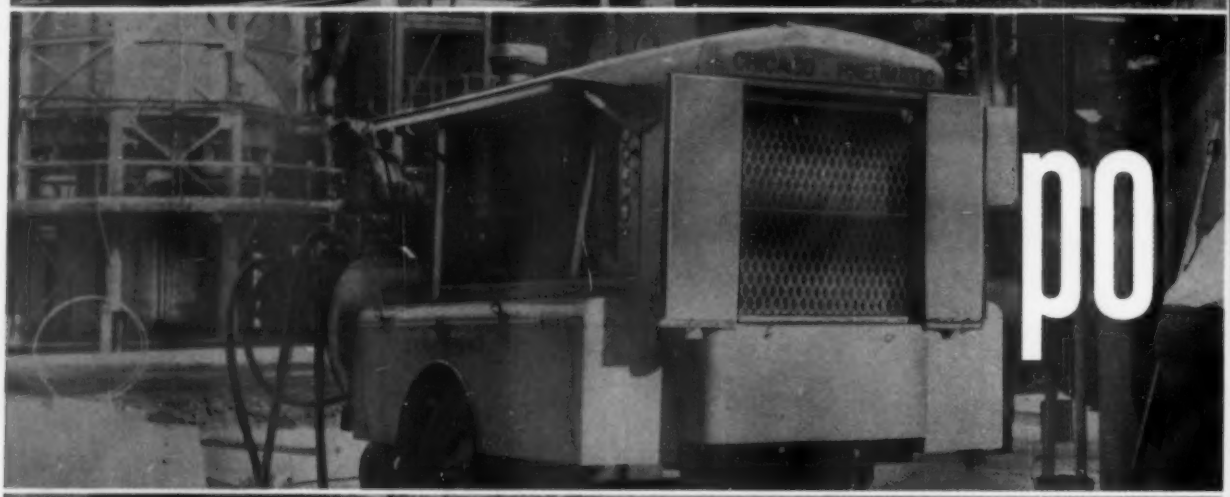
Essential Chemicals From Hydrocarbon Sources



THE GM DIESEL ALL-PURPOSE POWER LINE
20 to 1650 H.P.
in only 3 cylinder sizes

NEW "2-53" 20 to 47 H.P.

"2-71" 33 to 67 H.P.

NEW "3-53" 38 to 97 H.P.

"3-71" 51 to 118 H.P.

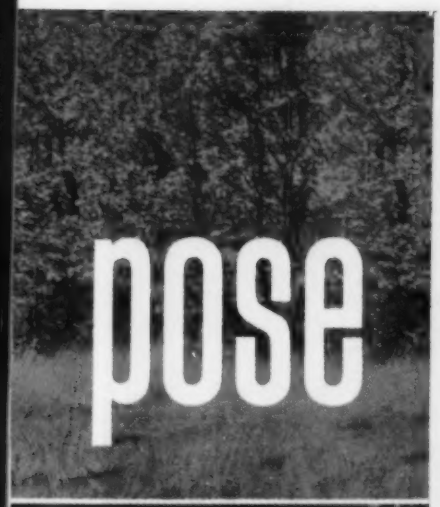
NEW "4-53" 51 to 130 H.P.

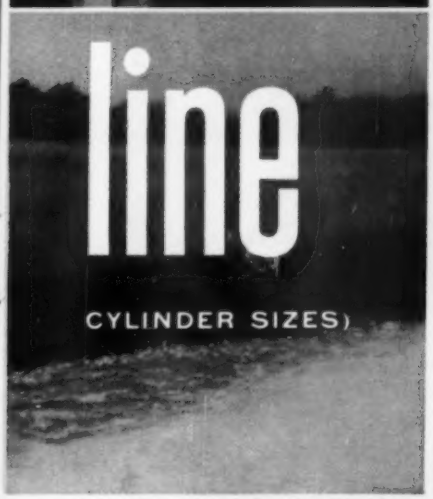
"4-71" 69 to 167 H.P.

NEW "6V-53" 76 to 195 H.P.

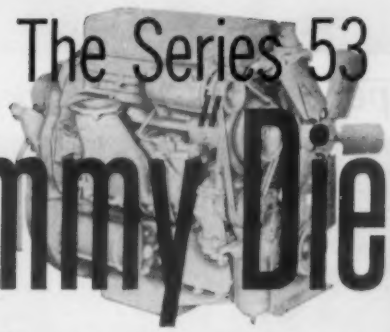
"6-71" 112 to 252 H.P.

NEW TURBOCHARGED RATINGS





The Series 53 "Jimmy" Diesel



NEW FOR THE PETROLEUM INDUSTRY

Smaller and more compact 2-, 3-, 4-, and V-6 cylinder engines based upon the dependable GM Series 71 Diesel

New as tomorrow is the power concept which GM Diesel has embodied in its All-Purpose Power Line to help you pull more profits out of each hole.

Using only 3 cylinder sizes, GM Diesel engineers have more than doubled the number of basic engines—vastly increased the power range—yet maintained the famous GM Diesel family relationship and parts interchangeability.

This concept is dramatically illustrated in the Series 53 "Jimmy" Diesel. For *only* in these Diesels are combined *all* the profit-making, cost-saving advantages *any* Diesel has ever had.

Compare them horsepower for horsepower:

> They cost less, weigh less, take up less room. Accelerate faster, last longer, and parts cost less. They're easier and less expensive to repair and maintain—far more efficient, too.

All these advantages add up to high earning power and real operating economy. Put a Series 53 "Jimmy" Diesel to work. It will pay for itself amazingly fast when it takes over from a gasoline engine.

This Series 53 "Jimmy" Diesel is *literally* All-Purpose Power in the 20- to 195-H.P. range. Consider it for your needs. Write GM Diesel, Dept. O-2, Detroit 28, Michigan, and see what these new Series 53 "Jimmy" Diesels can mean to your drilling profits.

GM DIESEL

DETROIT DIESEL ENGINE DIVISION,
GENERAL MOTORS, DETROIT 28, MICH

In Canada: GENERAL MOTORS DIESEL, LIMITED, London, Ontario
Parts and Service Worldwide

NEW
"6V-71"
112 to 252 H.P.

NEW
"8V-71"
150 to 334 H.P.

"6-110"
160 to 335 H.P.

NEW
"12V-71"
224 to 504 H.P.

NEW
"16V-71"
300 to 675 H.P.

NEW
"24V-71" (Twin 12)
448 to 1008 H.P.

"32V-71" (Twin 16)
600 to 1350 H.P.
(Turbocharged—1650 H.P.)

Gasoline Plant . . .

Built With An Eye To The Future!

This modern absorption-type gasoline plant*, like most modern plants of today, was built with an eye to the future . . . with later expansion in mind.

Currently stripping 100 MMSCF of natural gas per day of propane, iso-butane, normal butane and natural gasoline, it can be quickly and inexpensively expanded to handle an additional 50% of its present capacity.

One very important reason for this plant flexibility was the incorporation in its design of wide range and capacity controls, such as BS&B Super 70 Control Valves, Liquid Level Controls and Regulators.

BS&B Controls are everywhere proving themselves in many different oilfield and other applications the world over. Why not specify them on your next job!

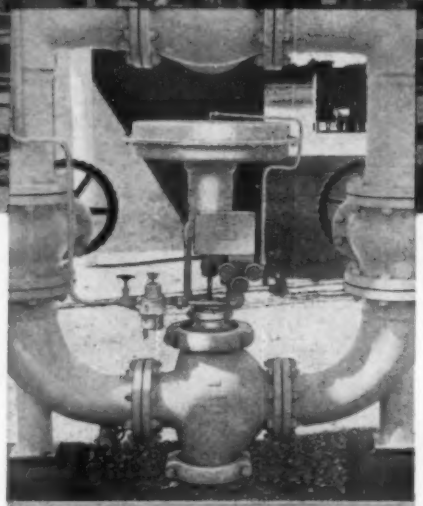
* Name and location supplied on request.

SUPER BS&B 70

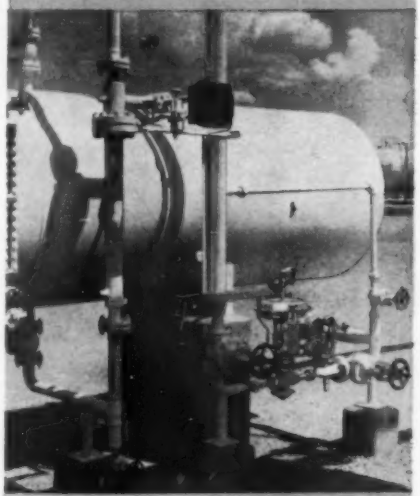
BLACK, SIVALLS & BRYSON, INC.

Controls Division, Dept. 4-A2

7500 East 12th Street Kansas City 26, Missouri



This 6", 150 lb. Super 70 serves as an accumulator pressure control valve. It is equipped with a direct acting actuator and valve positioner.



Butane splitter reboiler equipped with a BS&B Type 71-06 Series 2 Liquid Level Controller with automatic reset relay and a 1" Super 70 valve.

insert the plug ...save the valve!

Safely recover expensive valves when abandoning temporary or semi-permanent connections by using Mueller® Save-A-Valve Drilling Nipples.

A NO-BLO® Completion Plug is inserted through the valve under pressure and screwed into the top of the nipple. This exclusive plug, with "O" ring seal, effectively seals the connection while the valve is removed and the nipple is capped.

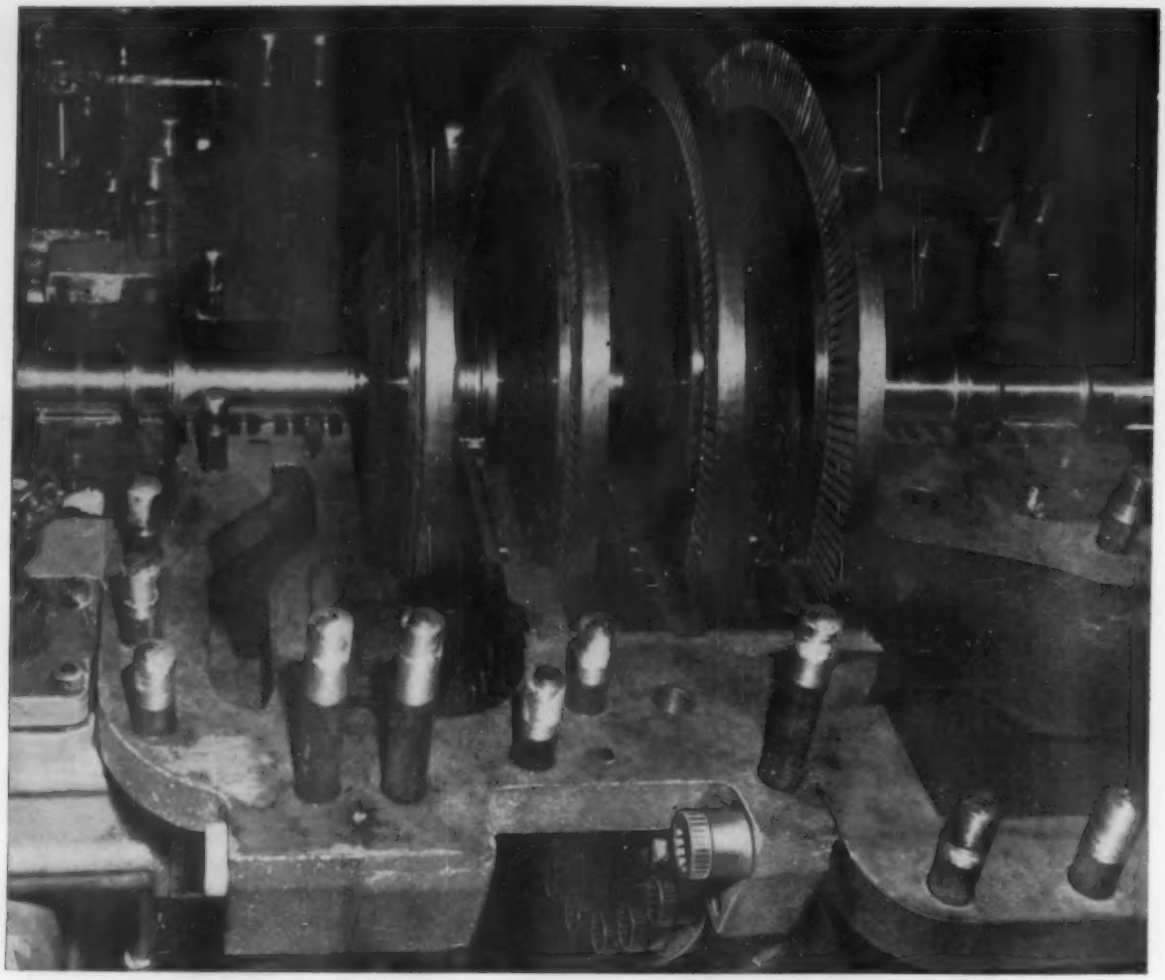
Built-in pressure equalizing valve in the plug permits it to be removed at anytime. Connection can be used again and again.

These features of Mueller Save-A-Valve Drilling Nipples permit the active use of every valve in a system—greatly reducing the total number of valves needed. They are typical, however, of the great attention to detail in research, design and engineering that become a part of every Mueller product.

NO-BLO

MUELLER CO. **DECATUR, ILL.**

Factories at: Decatur, Chattanooga, Los Angeles; In Canada: Mueller, Limited, Sarnia, Ontario



THE INSIDE STORY OF A MURRAY HIGH SPEED COMPRESSOR

DRIVE TURBINE REVEALS THE REASONS FOR MURRAY'S UNIVERSAL ACCEPTANCE

A look at MURRAY'S rugged construction from the inside shows the husky shaft and heavy accurately formed discs with generous sized hubs designed to withstand the axial and radial stresses imposed by this type of service.

Large-dimension disc rims receive the specially contoured stainless steel blades with the Murray integral shroud. This insures smooth steam passages with maximum strength.

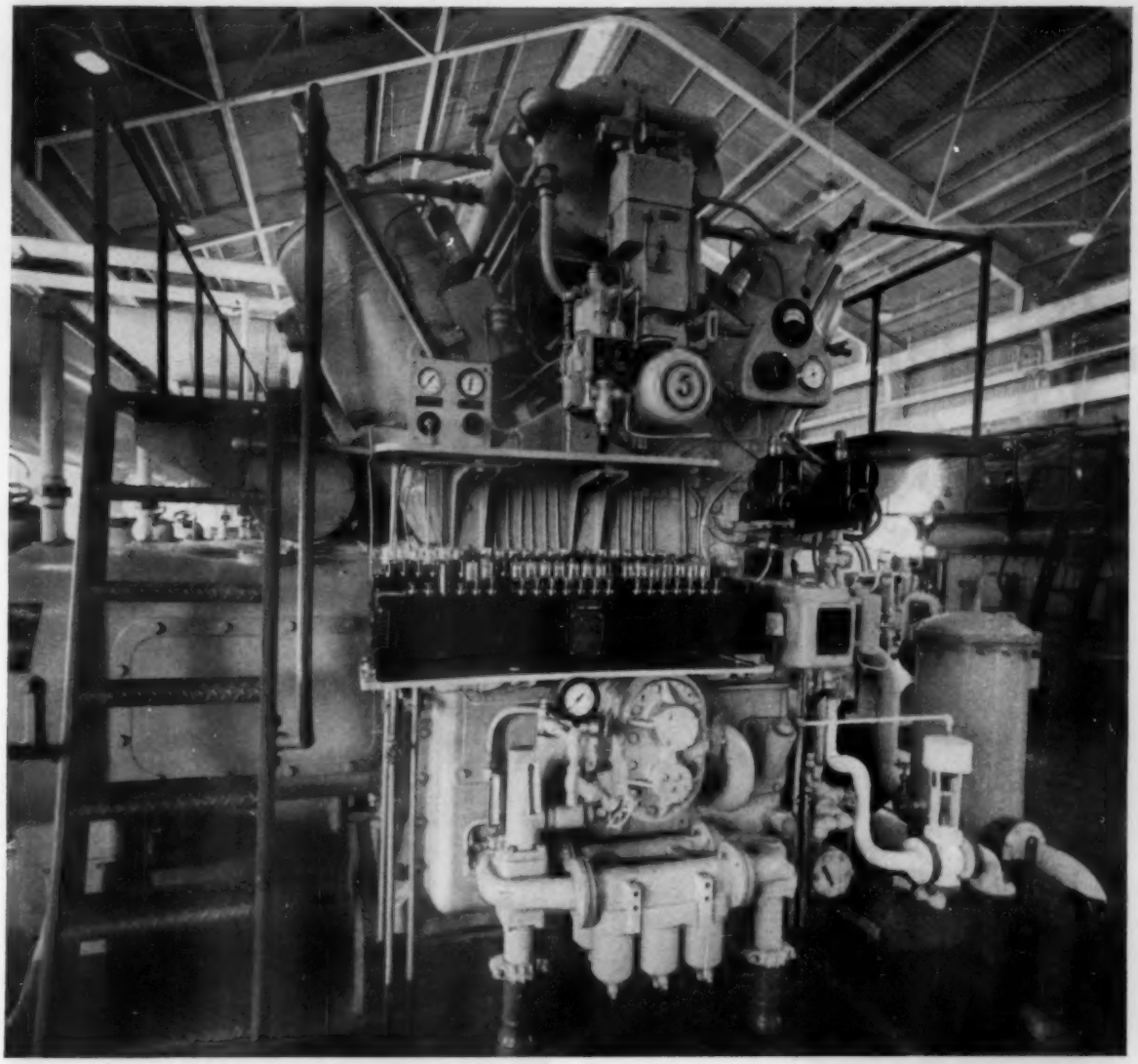
Short bearing spans insure smooth operation and eliminate the hazard of operating in critical speeds.

A look at the heavy flanges and husky bolting in the actual unretouched shop photo shown above bears out the extreme ruggedness that typifies every feature of Murray construction.

Our nearest representative will gladly help you solve your high speed compressor drive turbine requirements. Just write to Murray Iron Works Company, Burlington, Iowa, for his name.

Murray
TURBINES

MURRAY IRON WORKS COMPANY • BURLINGTON, IOWA
Builders of Steam Power Equipment for Nearly a Century



BENDIX MAGNETOS SPARK COOPER-BESSEMER ENGINES FOR EL PASO NATURAL GAS

Once again, Bendix* ignition equipment is proving its worth to the petroleum and natural gas industries. Shown here is a Bendix LAR magneto and Hi-V transformer coil installation at El Paso Natural Gas Company's Blanco Station in San Juan County, New Mexico. El Paso uses eight 1350 hp. Cooper-Bessemer gas compressors, all equipped with Bendix magnetos, at its mainline gas booster station.

Bendix LAR magnetos deliver dependable ignition at the lowest practicable cost. Even under the most adverse operating conditions, their reserve power ensures smooth engine performance. The Bendix LAR magneto and Hi-V transformer coil form a matched ignition system to handle rugged engine requirements.

LA magnetos now in service can easily be converted to the modern Bendix LAR type with conversion kits now available. They can be obtained from your Bendix ignition distributor or from the factory. For complete details, write SCINTILLA DIVISION OF BENDIX AVIATION CORPORATION, Sidney, New York.

*REG. TRADEMARK

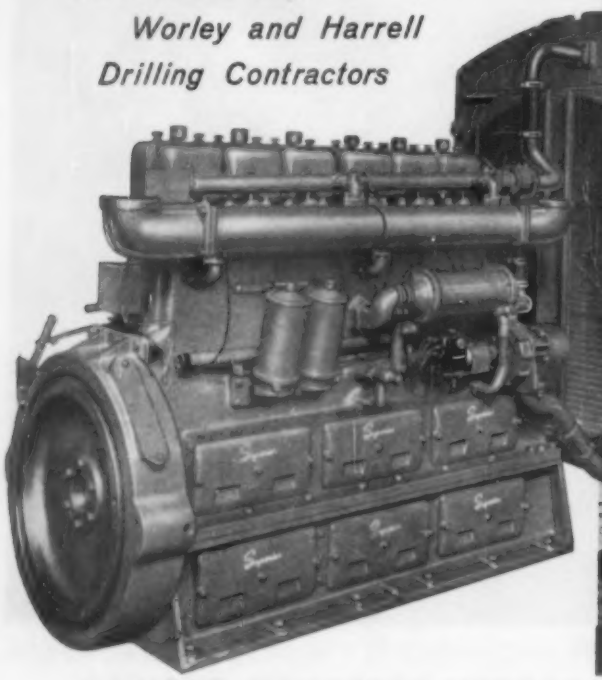
Scintilla Division
SIDNEY, N. Y

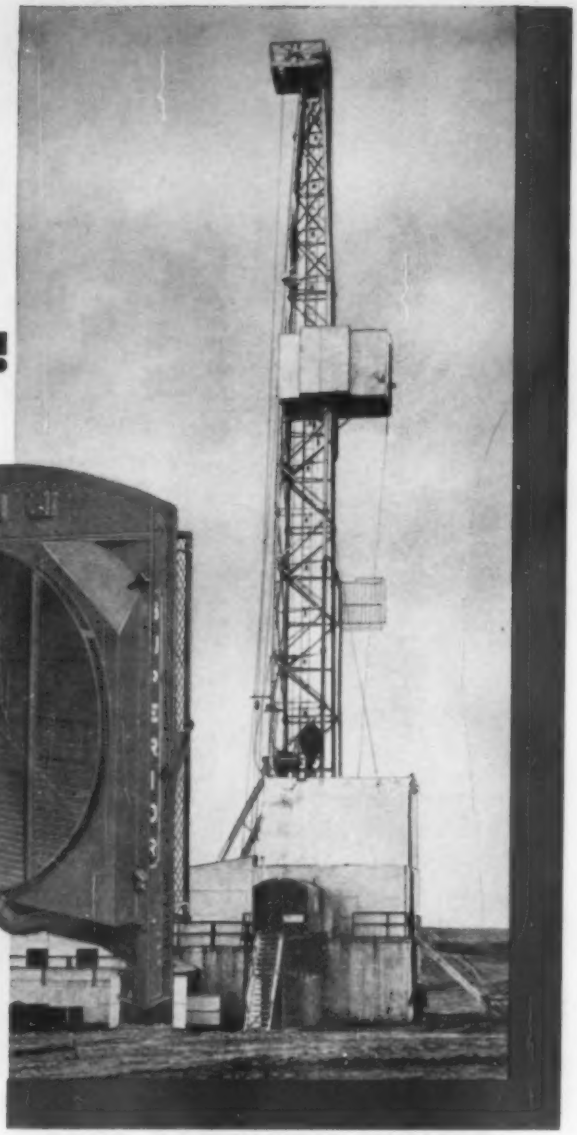
Bendix
AVIATION CORPORATION

six Superiors

268.6|| engine hours... no major overhauls!

"We're sold" says Worley and Harrell Drilling Contractors





Six Superior 6G-510 gas engines are performing with profit-boosting dependability in cold-weather country for Worley & Harrell Inc. of Tulsa. Powering two 80B rigs that have drilled 898,107 ft. of hole in the Williston Basin, the 6-cylinder Superiors are still going strong after 268,611 engine hours without overhaul. No major parts replacements have ever been required, such as cylinder liners, pistons, bearings, crankshaft, cylinder block, etc.! Engines of other makes often are completely replaced during this length of service. All engine service needed, in over six years of continuous operation, took place right on the rigs!

"Best drilling engines we've ever seen," declares Burrel Harrell, Vice President and Drilling Superintendent. President Loyd Worley agrees. They practice good maintenance, hire top crew men, but mainly credit Superior's high quality construction for insuring trouble-free power on long-run jobs. Contributing to minimum maintenance and repair costs are Superior's simplicity, rugged design and elimination of high mortality parts.

Worley & Harrell's experience proves that if your power requirements are in the 190 to 2150 BHP range, it pays to specify White Superior engines! Get complete information today from leading rig manufacturers, White oil field representatives or through White Diesel Engine Division.

White Diesel

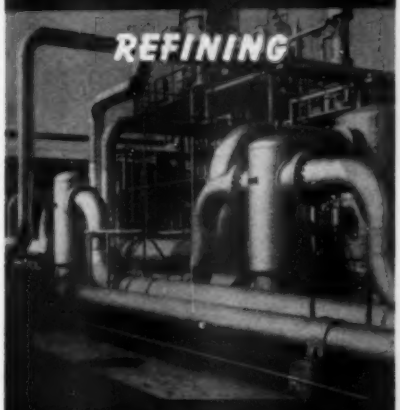
WHITE DIESEL ENGINE DIVISION
THE WHITE MOTOR COMPANY

Plant and General Offices: Springfield, Ohio

PRODUCTION

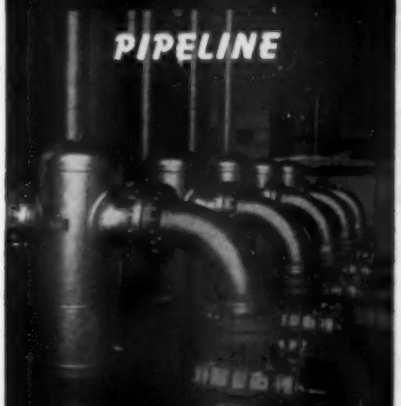
Pictured above is a Peerless Line Separator removing moisture from fuel to drilling rig.

REFINING



These two Peerless Line Separators are doing an efficient job of mist extraction in the Petrochemical plant in Kentucky.

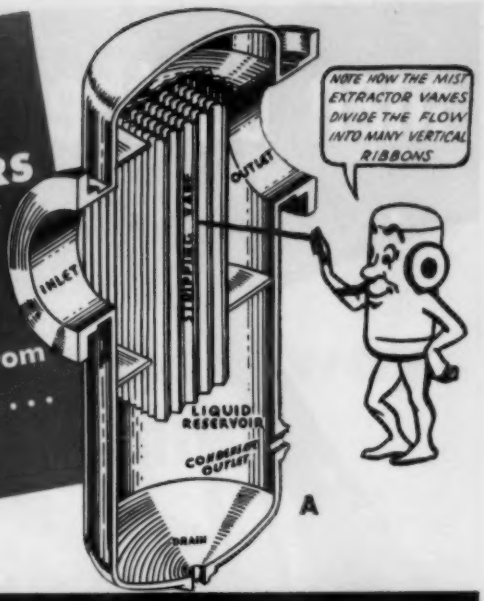
PIPELINE



FIVE Peerless Line Separators are shown above as they handle carry over from large scrubbers.

PEERLESS LINE SEPARATORS

Outstanding for the efficient extraction of liquid mist from gas or steam . . .



B
FLOW
TOP VIEW
MIST COLLECTS INTO DROPS ON THE WET SURFACES
DROPS IMMEDIATELY ENTER DEEP POCKETS OUT OF GAS FLOW
BIDIRECTIONAL CHANNEL AIDS IN LIQUID SEPARATION
GAS IS STRIPPED DRY LONG BEFORE REACHING END OF VANES

HIGH EFFICIENCY—HIGH CAPACITY LOW PRESSURE DROP

Thousands of installations throughout the oil industry . . . production, pipeline, refining and petrochemical . . . prove the Peerless Line Separator principle to be one of the most outstanding methods available for the extraction of liquid gas, steam or air.

Drawing A above shows the arrangement of the vanes in the Separator. Drawing B is an illustration of the Peerless Principle.

The mist extractor combines the forces of impingement, centrifugal motion and surface tension to obtain its high efficiency. The path of the gas, etc., through the unit is constantly bending causing semi-violent turbulence and rolling of the gas against the walls of the vane. Impingement and centrifugal force combine to contact the droplets with the vanes, where they coalesce, and surface tension then causes them to cling to the vane's surfaces. Gravity and the impact of the gas steam then drive the droplets into the pockets where they roll down the vanes and out of the gas stream.

Through the Peerless method of mist extraction, the gas is stripped dry long before reaching the end of the vanes.

there's A PEERLESS SEPARATOR FOR EVERY REQUIREMENT

For any capacity
For any working pressure
For corrosive conditions
With removable vane units
With extra body length
With connections for accessory equipment
For pressure drop requirements of less than 6" water
For any vapor-liquid ratio
For any piping requirement

SPECIAL DESIGN SEPARATORS FOR ANY REQUIREMENT

FOR FURTHER INFORMATION ON THE USE OF PEERLESS LINE SEPARATORS PLEASE WRITE FOR NAME OF NEAREST PEERLESS ENGINEER.

PEERLESS MFG. CO.

"OVER 20,000 SEPARATORS and SCRUBBERS IN SERVICE"

PEERLESS MANUFACTURING CO.

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man on the verge of discovery

BJ swabs

He's already discovered that Byron Jackson's new swabs cost less because they require fewer parts and accessories to accomplish more kinds of swabbing jobs.

Before the day is over he'll discover that BJ swabs put more fluid in the tank, in less time, with fewer rubber replacements.

BJ swabs pull the greatest possible loads — yet their exclusive flexible feature allows them to adjust to light or medium loads, too.

You get a choice of cup-type or disc-type rubbers. Two of either kind fit on the streamlined body. Your supply store has BJ swabs in stock. The investment is small; discover them for yourself.

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DU PONT *Petroleum Chemicals* NEWS

Number 94 in a Series of Bulletins for the Petroleum Industry

JANUARY-FEBRUARY 1959

New Du Pont RP-2 adds 3-way salespower to gasolines

"It Never Rains Oil" depletion movie still playing to packed houses

The story of petroleum is still "big box office" around the country.

Probably one of the best signs of this is the continued success of "It Never Rains Oil," the full-color cartoon movie that tells the story of oil exploration, consumption and *depletion*.

Year after year, the film plays to capacity audiences of civic organizations, clubs, service station operators, and other groups in which opinion is formed.

It shows how oil is bringing better things into all our lives—from paints to pants, from synthetic rubber to better lubricants.

Explains need

The movie goes on to show the dramatic search for oil—and the tremendous odds that face the searchers – as well as the growing consumption that makes an ever wider search necessary. It explains the government's recognition of the great cost of the search, in the form of a percentage depletion allowance. The film explains why this tax relief is desirable, necessary and fair.

Promotes better understanding

After viewing "It Never Rains Oil," audiences often report that they have a new, more appreciative viewpoint of what the oil industry is accomplishing. They better understand its problems and plans. If you would like to arrange showings, simply write, telling us when you would like to borrow the film and how long you would like to have it.

Now refiners and marketers can improve their gasolines with "Du Pont RP-2," another product of Du Pont research to improve performance of petroleum products.

HOW RP-2 CAN SELL FOR YOU: Sample advertising kit, prepared by Du Pont's Advertising Department, shows how the use of RP-2 can be advertised and create new excitement for your brand of gasoline.

RP-2 adds three distinct kinds of improvement to gasolines:

Prevents Rust. RP-2 "plates out" on metals, forming a barrier between the metal and any moisture that may be present in the gasoline. Thus rusting is prevented throughout the automobile fuel systems from gas tank to carburetor. Incidentally, RP-2 also offers the same protection at the refinery and in the fuel distribution system.

Stops Carburetor Icing. RP-2 prevents stalling during idling caused by ice formation on the carburetor throttle plate. Many gasolines need this protection when the temperature ranges from 22 to 55°F. and relative humidity exceeds 65%.

Provides Detergent Action. RP-2 has a positive detergent action which not only keeps new carburetors clean but gradually cleans the throttle plate and throat of carburetors which have become dirty through long use.

The above advantages add up to improved performance on the highway and better satisfied gasoline customers. As mentioned above, there are also economy advantages for the refiner in the rust-preventive characteristics of the additive in protecting storage and shipping equipment.

Another important property of RP-2 is that it contains phosphorus. This makes it especially attractive to refiners already using phosphorus compounds for control of surface ignition. Thus, by taking a "phosphorus credit" the cost of protection against rust, carburetor icing and carburetor deposits is appreciably reduced.

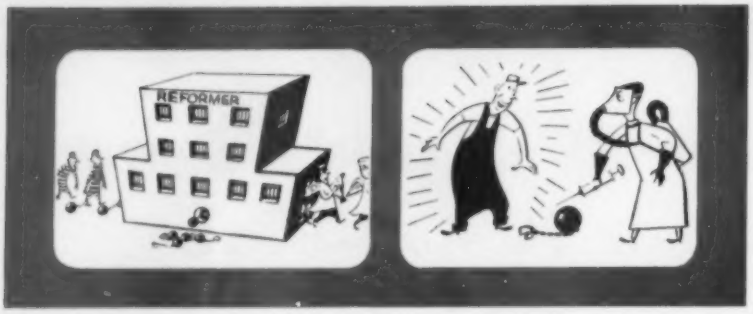
While it has been widely adopted for use in motor gasolines, RP-2 is also an excellent rust preventive for aviation gasoline. And it is particularly interesting for jet fuel because, in some cases, rust preventing dosages also improve the CFR fuel coker ratings of the fuel.

Write for technical information.

ADVERTISEMENT—Prepared for the Petroleum Chemicals Division of E. I. du Pont de Nemours & Company (Inc.)

DU PONT *Petroleum Chemicals* NEWS

"Good Gasoline" movie goes before cameras a second time — for a new, modern look



MOVIE SHOWS HOW reforming (left) and addition of TEL (right) turn "bad" hydrocarbon molecules into good ones to prevent knock.

"What Makes Today's Gasoline Good" —the Du Pont sound-and-color movie that's been a hit with refiners and dealers for a number of years—has had its face lifted.

Writers, directors, actors and camera crews have been hard at work for the past several months, bringing it up to date.

The story line has changed, but the primary message remains as it was, a description of how refiners use cat-cracking, reforming, and tetraethyl lead and other additives to give gasoline the right qualities for good engine performance.

It compares "regular" and "premium" grades of gasoline, and uses amusing cartoon characters to explain knock, vapor lock, the reasons for seasonal blends, and other important aspects of gasoline.

The movie is perhaps one of the fastest, most memorable ways of showing and convincing service station operators (and even refinery employees) that much more goes into a gallon of gasoline than the average motorist realizes. Enthusiasm is created, along with improved sales-consciousness, when the picture is shown at dealer meetings.

Showings of the Du Pont movie can be easily arranged through your Du Pont representative, or by writing direct to Wilmington.

YOU OUGHT TO KNOW...

ROBERT M. GLOVER was recently appointed Manager, Sales Programs, in the Petroleum Chemicals Division of the Du Pont Company, a position he assumed after vacating the office of Assistant Sales Manager. There his chief interest was tetraethyl lead sales combined with administrative duties concerned with manpower in the five regions of the division.

Mr. Glover brings to his new position a wealth of experience also in the petroleum additives field, where he has helped Du Pont customers solve a wide variety of blending and marketing problems.

At one time, Mr. Glover served as Manager of the Du Pont Petroleum Chemicals Division's Mid-Continent Region, with headquarters in Tulsa. In that capacity, he served all Du Pont customers in the area with the complete Du Pont line from tetraethyl lead to the most specialized additives.

Winter freeze gets a cold shoulder from pipe that's made from oil

"If winter comes, can the plumber be far behind?" might be the modern version of one of the poet Shelley's famous lines.

It *might*, but the oil industry is changing all that. No longer does the freezin' season mean that pipes must freeze up and be repaired. In industry, the use of "Alathon"* polyethylene resin pipe is eliminating this costly and often dangerous problem.

Pipe of "Alathon" is made of a plastic based on petroleum. Its most remarkable quality is its flexibility. Instead of freezing and bursting, it simply expands. Even at 40° below zero, this pipe can be bent around corners.

Another advantage is its extreme light weight. Its corrosion resistance and its lack of odor and taste are bonus advantages.

"Alathon" polyethylene resin is the same material from which literally millions of squeeze bottles of cosmetics and many other products are made every year.

This is one further example of the growing contributions of *oil* in bringing better living to more people, through chemistry.

**Reg. U.S. Pat. Off.*

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Philadelphia 2—3 Penn Center Plaza . LOcust 8-3531
Pittsburgh 22—1 Gateway Center . . . ATlantic 1-2933
San Francisco 4—111 Sutter St. . . . . EXbrook 2-1934
Seattle 3—4003 Aurora Ave. . . . . MElrose 2-6977
Tulsa 1—1811 So. Baltimore Ave. . . . . LUther 5-5578
In Canada—Du Pont of Canada Limited, Petroleum Chemicals, 85 Eglinton Ave. East, **Toronto 12**—Ontario . . . . . HUdson 1-6461

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DU PONT
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Better Things for Better Living
. . . through Chemistry

Du Pont Tetraethyl Lead and other Petroleum Additives

ADVERTISEMENT—Prepared for the Petroleum Chemicals Division of E. I. du Pont de Nemours & Company (Inc.)

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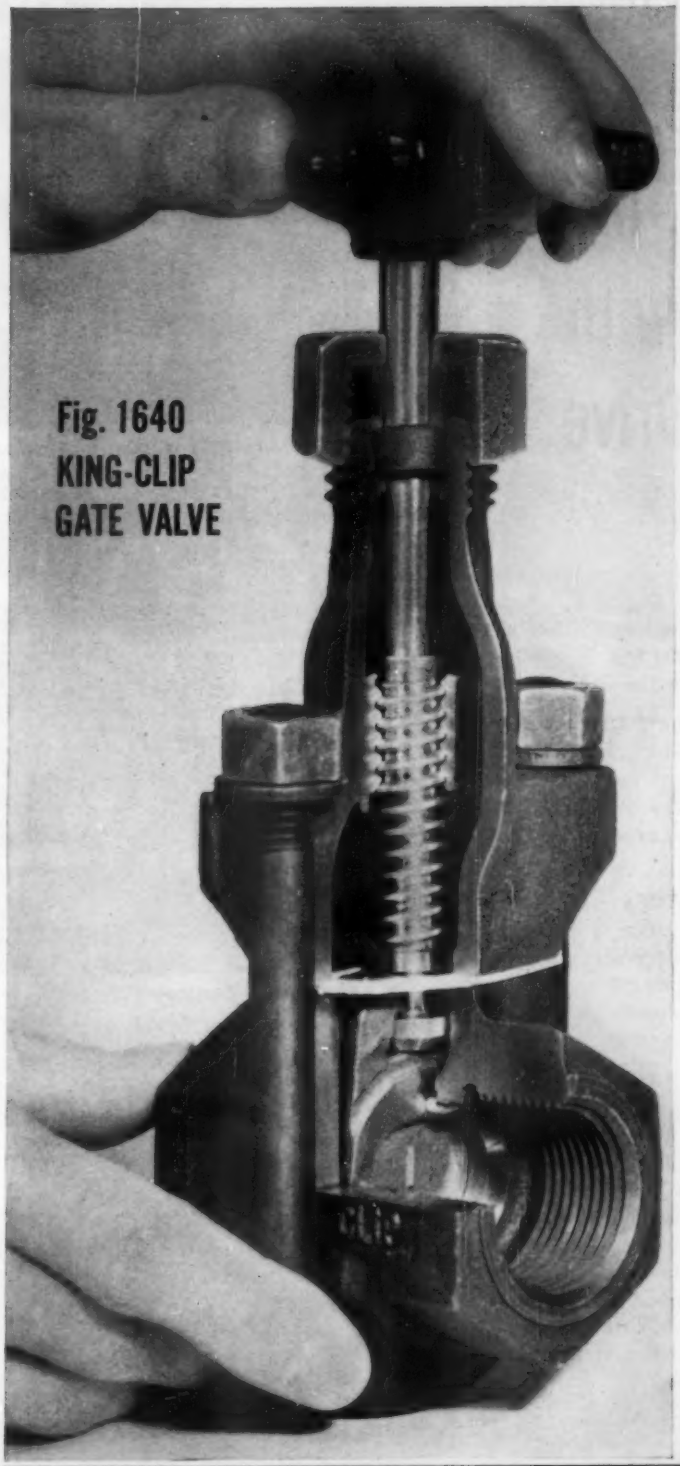

NOW you can SEE why

THE ORIGINAL KING-CLIP® VALVE by LUNKENHEIMER CUTS MAINTENANCE

Feature-for-feature, it's easy to *see* why King-Clip outperforms other clip valves... keeps maintenance costs low. Its precision-machined *Stemalloy® stem* assures longer stem thread life. *Seats and discs* are precision fitted to assure tight closure, even through thick liquids. *Extra-long pipe threads* extend deep into the body for pressure-tight connections. *Bodies* are rigid and extra-sturdy. And the exclusive *Non-Slip® handwheel* makes opening and closing easy—even with wet or oily hands.

Your Lunkenheimer Distributor will be glad to show you the important differences between King-Clip and other clip valves. He will arrange a comparison test that will show why King-Clip cuts maintenance costs . . . assures longer-lasting service. Or write The Lunkenheimer Co., Cincinnati 14, Ohio.

LUNKENHEIMER L QUALITY

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THE ONE *Great* NAME IN VALVES

Natural Gas and Oil Company reports...*

Less Maintenance and Down Time, Faster, More Efficient Drilling with General Electric Drive

DRILLING BARGE RAY TERRY is shown on location in the East Golden Meadows area of Louisiana. Greater efficiency of G-E Drive has enabled Natural Gas and Oil Company to drill more hole at less cost.

NATURAL GAS AND OIL'S "RAY TERRY" has set an outstanding performance record since it was put into service. During a recent six-month period, this barge, equipped with a General Electric Drive System, drilled four holes—all over 12,000 feet. Virtually no down time or maintenance was attributed to the G-E Drive.

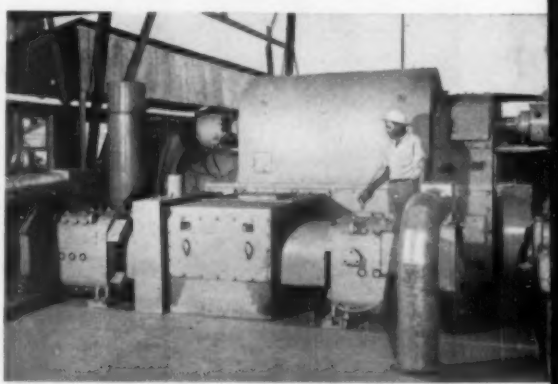
"WE ARE EXTREMELY SATISFIED WITH THE G-E DRIVE on our Ray Terry barge and, based on the equipment's highly successful performance during the past year, we could not have made a better purchase." This sums up how Natural Gas and Oil Company management feels about their first operating experience with General Electric Drive.

MANY OTHER CONTRACTORS AND OPERATORS have also found that G-E Drive provides faster, more efficient drilling. Electric drive delivers 10 to 15 percent more engine-output horsepower to the drilling task than other types of rig drives. Instantaneous flexibility of power assignment is available to the driller merely by moving the selector switch on his control console. The faster, more efficient drilling provided by the G-E Drive System adds up to more hole at less cost.

DRILLER HAS POSITIVE DRILLING CONTROL at all times. Ray Terry drillers report that G-E controls are simple to understand and easy to operate, allowing greater command over drilling functions.

FOR MORE INFORMATION ABOUT GENERAL ELECTRIC DRIVE and how its advantages can benefit your drilling operations, whether on land or offshore, call your nearest G-E Apparatus Sales Office. Drilling offices are located in Dallas, Denver, Houston, Los Angeles, New Orleans, and Tulsa; in Canada: Calgary and Toronto. For overseas requirements, International General Electric drilling offices are in Bogota, Buenos Aires, Caracas, Maracaibo, Mexico City, Puerto LaCruz, and New York. General Electric Company, Locomotive and Car Equipment Department, Erie, Pa. 115-29

*Natural Gas and Oil Company, a Division of Mississippi River Fuel Corporation.

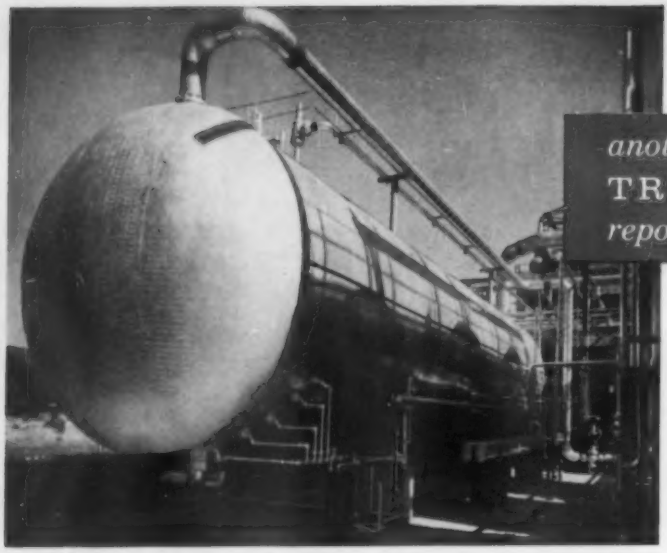


DRAWWORKS DRIVEN BY TWO GE-752 DRILLING MOTORS enables the rig to drill to depths of over 20,000 feet. General Electric's service-proven drilling motors and generators require little maintenance, help reduce drilling costs.

Progress Is Our Most Important Product

GENERAL ELECTRIC

See our exhibit at the International Petroleum Exposition, Tulsa, May 14-23, and 5th World Petroleum Congress, New York, June 1-5.



another
TRETOLITE SERVICE
report

OVER 1½ MILLION BARRELS OF CRUDE OIL ARE DESALTED EVERY DAY BY TRETOLITE DESALTERS

...average cost: $.0013 per barrel!

TRET-O-LITE* Chemical Desalters are at work in refineries throughout the world, reducing salt contents in the 95% to 100% range, at an average total chemical cost of about 1.3 mills per barrel.

HOW TRET-O-LITE CHEMICAL DESALTING WORKS

The quantity of the proper TRET-O-LITE destabilizer is proportioned into the crude suction line of the charge pump to assure complete dispersion. Washwater (5% by volume of crude charge) is injected immediately following the charge pump. An optional water injection point in the crude suction line is provided for additional water-to-oil contact. The oil, chemical and washwater mixture are elevated to operating temperature, passed through an emulsifying valve, and through a Tretolite-designed coalescing section to promote particle growth. The mixture then enters the desalting vessel which is internally designed to provide additional water-washing and oil residence time. The salt-free crude flows directly to the still and the effluent saline water to the sewer.

*TRET-O-LITE *is a registered trade-mark of Petrolite Corporation*

4-WAY CHOICE AVAILABLE TO TRET-O-LITE DESALTER USERS

Four plans are available for installing efficient TRET-O-LITE Chemical Desalting at your refinery: **1.** *Standard Proposal.* Construction according to plans and specifications supplied by TRET-O-LITE; **2.** *Standard Proposal (With Guarantee).* An engineering fee is charged when operating efficiency and TRET-O-LITE desalting ratios are guaranteed. An acceptance test is conducted to assure that guarantees are met; **3.** *Outright Purchase.* Tretolite delivers all equipment for erection by refiner or his contractor; **4.** *Rental with option to purchase.* Equipment furnished for erection by refiner with payment based on predetermined annual rental fee.

All plans receive thorough Tretolite inspection during construction, as well as supervision during start-up and acceptance tests.

For complete information *ask the Man in the Red Car.* Or write to...

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NO LEAKAGE...

You're looking at the newest thing in valves . . .

STOCKHAM'S NEW WEDGEPLUG* "O-SEAL" VALVE

Two Teflon** "O" rings in the plug give constant vapor-tight shut-off . . . to give you double assurance of double savings on operating and maintenance costs.

NO LUBRICATION...

HOW TEFLON "O" RINGS WORK The two Teflon "O" rings are inserted in dovetail grooves machined on the face of the plug. These "O" rings seat on the raised body seats when the plug is in closed position.

CONSTANT VAPOR-TIGHT SHUT-OFF This sealing effect of the "O" rings gives absolute shut-off in all cases—shut-off that remains permanently "bubble tight." The Teflon "O" rings are chemically inert, practically frictionless, and will not cold flow.

TESTS PROVE POSITIVE SHUT-OFF

Hundreds of tests of this new valve in all types of services have failed to make it leak. Performance has been remarkable. In every case, the valve held "bubble tight" because of the pressure seal effect of the "O" rings.

OTHER OUTSTANDING ADVANTAGES

Non-Lubricated—no costly maintenance necessary • Provides Double-Block and Bleed in most services • Quick, Easy Operation—won't stick or bind • Double Seating for Double Safety—Ground metal-to-metal seat provides shut-off in case fire burns out "O" rings • No Product Contamination • Protected Seats

RECOMMENDED USAGES Stockham's new "O-Seal" is recommended for all general purposes—air, gas, water, steam, propane, hydrocarbons, etc., as well as for hard-to-hold services. Recommended for temperatures from minus 300°F to 400°F and not exceeding 720 psi.

Available in carbon and alloy steels, 2" - 12" sizes, 150 and 300 lb. pressures. Three port openings—40%, 70%, full round-wrench, handwheel, gear, and motor operated.

*Patented
**Teflon DuPont Trademark

STOCKHAM'S NEW WEDGEPLUG "O-SEAL" VALVE

Call Your STOCKHAM Distributor or Sales Representative for complete details, or write today for the new brochure on the Wedgeplug "O-Seal."

Stockham makes a **BETTER** *valve...for* **EVERY** *job!*

WEDGEPLUG VALVE COMPANY Division of →

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Mud Pump Suction
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Air Hose
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Steam Hose
Fire Hose
Water Suction Hose
All-Purpose Hose

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SUPPLY

Here's how you can

CUT YOUR VALVE BILL HALF-IN-TWO

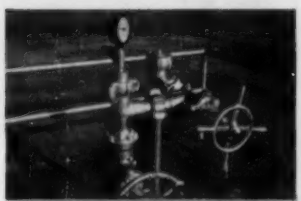
When you specify UNIBOLT Wing Valves you skimp on just one thing . . . cost. Where else can you get so much valve at so little cost? For instance, a 3000 w.p. UNIBOLT Wing Valve with threaded inlet and outlet costs little more than *half as much* as a comparable gate or plug valve.

Additional and continuing savings result from:

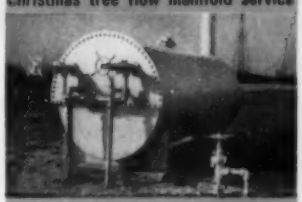
(1) Ease of repair in the field—no special tools or skill required.
(2) Repair parts, such as stems and seats, are inexpensive.
(3) Non-lubricated—no expense for greases and no labor for lubrication maintenance.
(4) A standard UNIBOLT Coupling on the outlet of the Wing Valve saves the price of a flowline union.

Furthermore: The UNIBOLT Wing Valve is also recommended for services where throttling is necessary; the 1-inch seat will pass 7 million cu. ft. of gas per day with only a 200-lb. pressure drop, 10,000 bbls. of fluid per day with a 100-lb. pressure drop; may be trimmed in hard chrome to resist abrasion, 11-13% chrome to resist corrosion; and may be readily converted to a positive type choke for production service.

If specifying or buying valves is your job, let us give you the complete story on UNIBOLT Wing Valves.



Christmas tree flow manifold service



Heater/treater service

Centralized production manifold

THORNHILL CRAVER CO.

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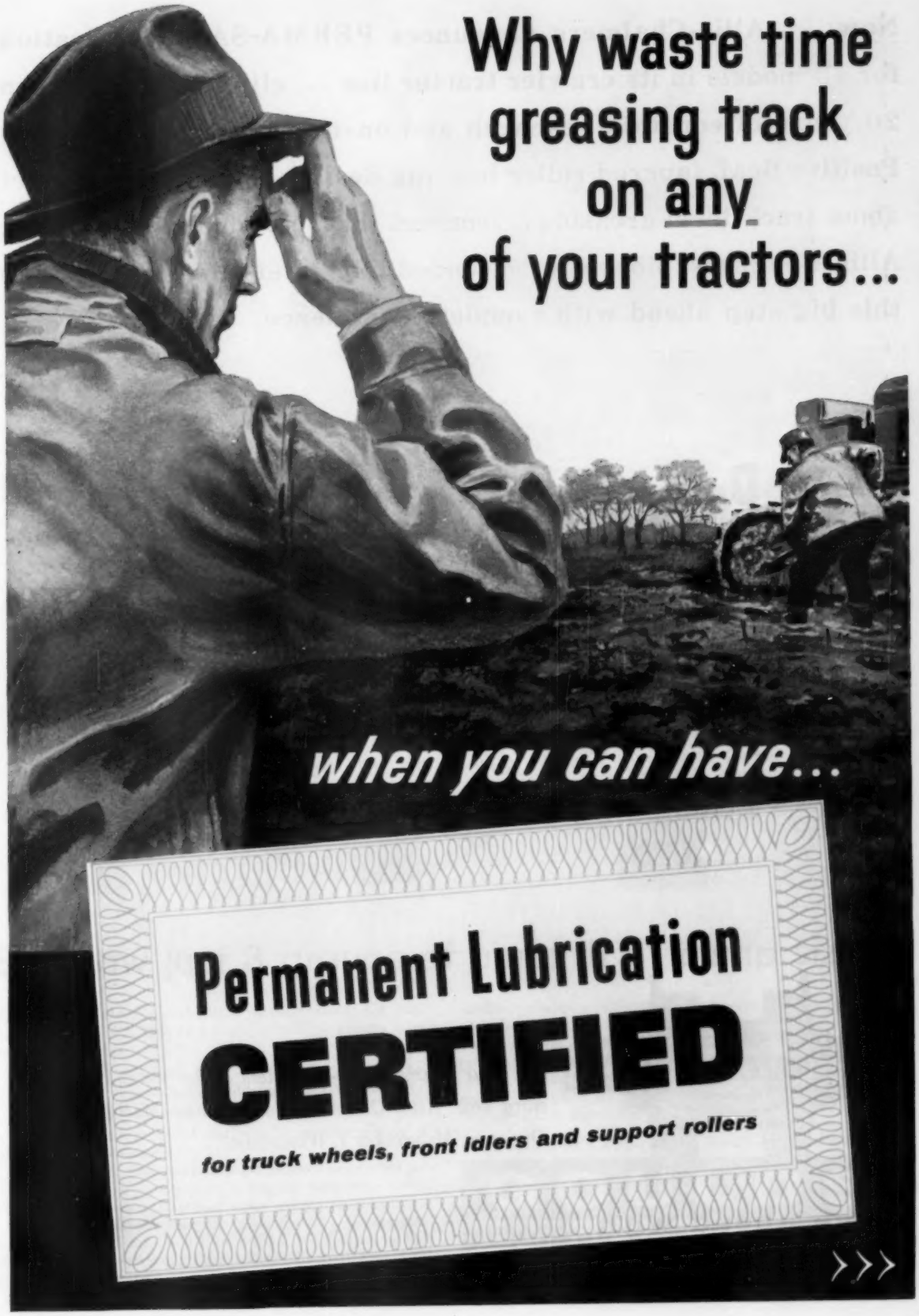
"An investor is not an exploiter. The modern enlightened political concepts of the free world make economic imperialism impossible. An investment is good only if it is mutually beneficial to the investor and the people of the host country. While the investor expects a return on the investment, the additional capital generated is plowed back into the host country to underwrite the continuation of industrial development."

Eugene Holman, Chairman of the Board, Standard Oil Company (New Jersey)

Esso

STANDARD OIL COMPANY (NEW JERSEY)

AND AFFILIATED COMPANIES

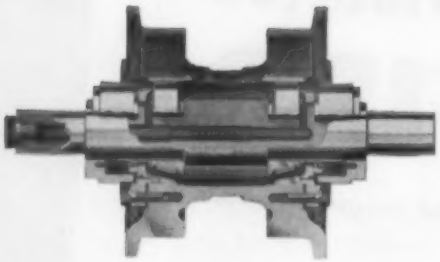

Why waste time greasing track on any of your tractors...
when you can have...
Permanent Lubrication
CERTIFIED
for truck wheels, front idlers and support rollers

Now . . . Allis-Chalmers announces PERMA-SAFE lubrication for all models in its crawler tractor line . . . climaxing more than 20 years of constant research and on-the-job experience with Positive Seal, tapered roller bearing design. Now you can forget about track-level greasing . . . convert that lost time to profit time. Allis-Chalmers, pioneer of extended lube intervals, lets you take this big step ahead with complete confidence.

Permanent Lubrication CERTIFIED

The Positive Seal PERMA-SAFE Wheel

for truck wheels, front idlers and support rollers on all models of Allis-Chalmers crawler tractors

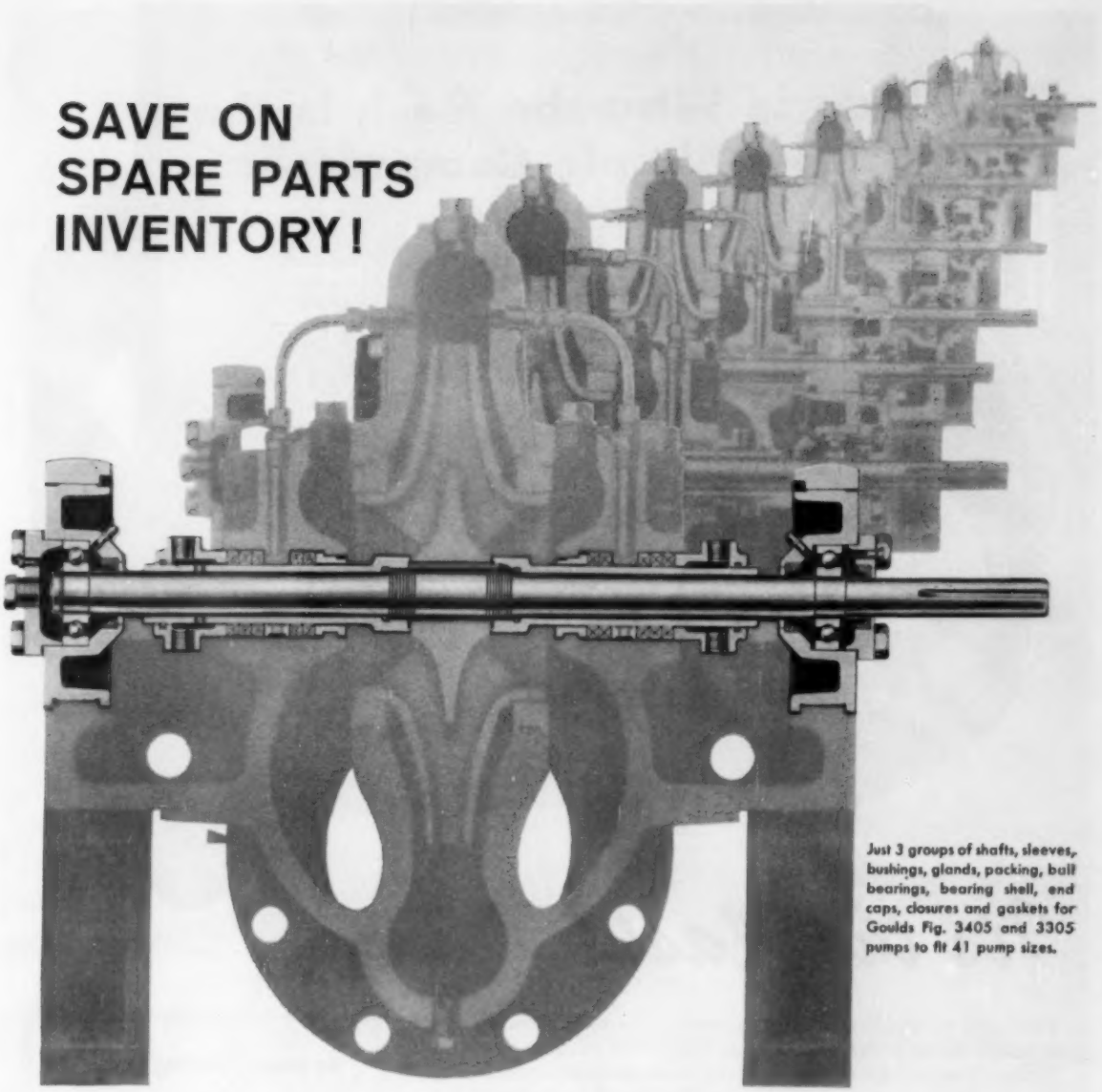


See your nearby Allis-Chalmers dealer for the full story now. Allis-Chalmers Construction Machinery Division, Milwaukee 1, Wisconsin.

move ahead with ALLIS-CHALMERS

. . . power for a growing world

SAVE ON SPARE PARTS INVENTORY!



Just 3 groups of shafts, sleeves, bushings, glands, packing, ball bearings, bearing shell, end caps, closures and gaskets for Goulds Fig. 3405 and 3305 pumps to fit 41 pump sizes.

See how just 3 groups of parts fit 41 pump sizes!

High degree of interchangeability of parts on Goulds Fig. 3405 single-stage and Fig. 3305 two-stage Centrifugal Pumps helps you save four ways:

1. You cut down your spare parts inventory.
2. You can make changes in the field to meet new requirements.
3. Off-the-shelf delivery of standardized parts.
4. You can get lower initial cost, due to standardization of parts during manufacture.

Just three shaft and rotating parts assemblies provide for 41 sizes of these two popular pumps. You cut spare parts inventories *up to 91%*, save the cost of unnecessary overstocking.

Up to 82 pump combinations are possible—considering right- and left-hand rotation—and rotation can be changed in the field due to unique sleeve locking device (patented). Mounting dimensions and motor drive bedplates are standardized to facilitate changing without the additional expense of drilling and tapping.

And . . . you get all of this at low cost! Standard parts make manufacture less costly. Goulds passes on the savings to you.

Find out how this maximum interchangeability can save you money by sending for Bulletins 721.6 and 722.6, or ask your nearest Goulds representative.

GOULDS PUMPS, INC., Dept. OG-29, Seneca Falls, N. Y.

GOULDS

PUMPS FOR INDUSTRY

It's the Nash!

There are no mechanical complications in a Nash Compressor. A single moving element, a round rotor, with shrouded blades, forming a series of buckets, revolves freely in an elliptical casing containing any low viscosity liquid. This liquid, carried with the rotor, follows the elliptical contour of the casing.

The moving liquid therefore recedes from the rotor buckets at the wide part of the ellipse, permitting the buckets to fill with gas from the stationary Inlet Ports. As the casing narrows, the liquid is forced back into the rotor buckets, compressing the gas, and delivering it through the fixed Outlet Ports.

Nash Compressors produce 75 lbs pressure in a single stage, with capacities to 6 million cu. ft. per day in a single structure. Since compression is secured by an entirely different principle, gas pumping problems difficult with ordinary pumps are often handled easily in a Nash.

Nash simplicity means low maintenance cost, with original pump performance constant over long periods Data on these pumps sent immediately on request

No internal wearing parts.

No valves, pistons, or vanes.

No internal lubrication.

Low maintenance cost.

Saves floor space.

Desired delivery temperature automatically maintained.

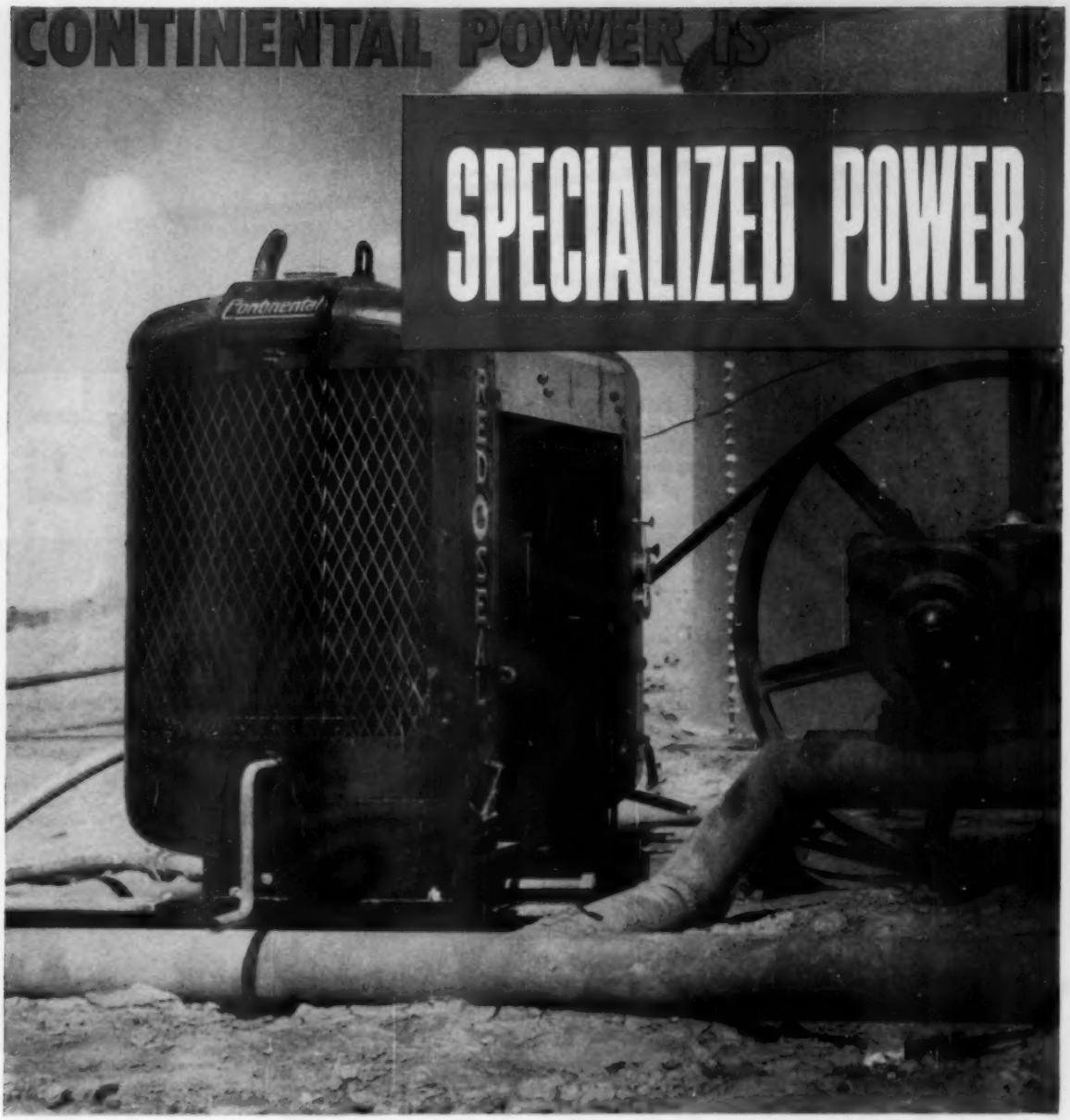
Slugs of liquid entering pump will do no harm.

75 pounds in a single stage.

NASH ENGINEERING COMPANY

313 WILSON, SO. NORWALK, CONN.

CONTINENTAL POWER IS SPECIALIZED POWER



Illustrated above is a Continental Model F-226 Red Seal powering a Wheatley Triplex used as a salt water disposal unit in Haskell County, Texas—another outstanding example of the specialization and diversification of the Red Seal line. In the industrial line of engines alone there are 60 basic models, for operation on all standard fuels, covering a range from 15 to 260 horsepower. . . . See your nearest oil field supply store, or write the factory for information.

Continental Motors Corporation

MUSKEGON • MICHIGAN

Powerful as the Nation — Continental Motors — America's Standard

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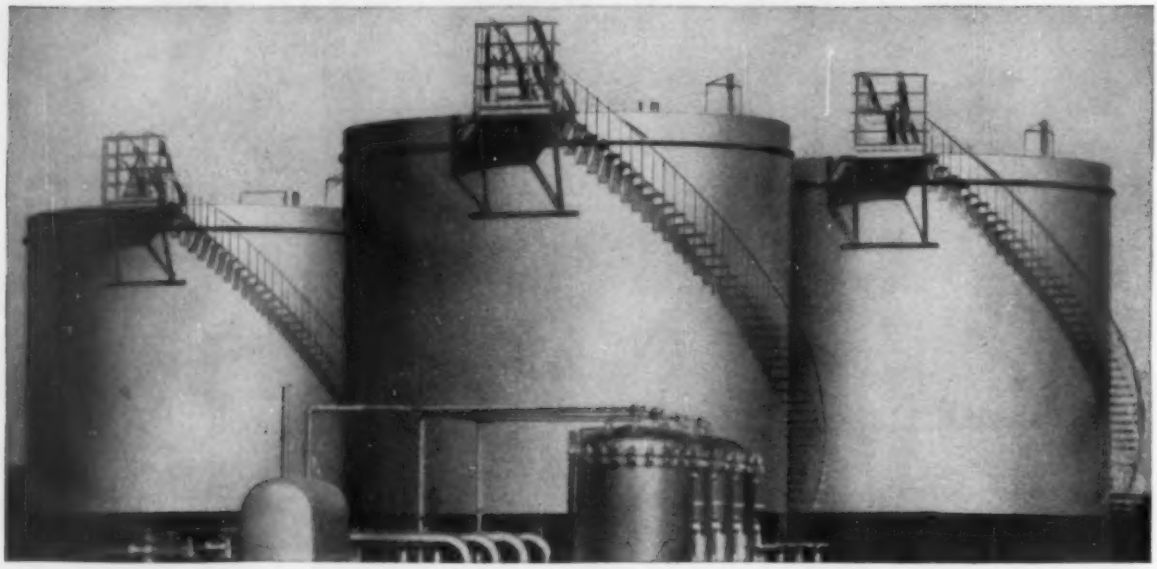
• FACTORY-APPROVED SERVICE AND GENUINE RED SEAL PARTS ARE AVAILABLE ALL OVER THE WORLD •

HAMMOND TUBESEALS* USHER IN *THE JET AGE*



FUELING THE PURE JETS at the International Airport, New York took special equipment and the know-how gained in fueling Viscounts and Britanias, says Petroleum Marketer in their November 1958 issue... also featured in their article about this pure jet installation is the equipment used... ***"ALL ABOVE GRADE TANKS ARE HAMMOND TUBESEAL FLOATING ROOF TYPE"***... this terminal is owned by the Port of New York Authority and is operated by Allied New York Service, Inc.

Tubeseal Floating Roofs were selected for this and hundreds of other installations all over the world for the very characteristics of their design and construction: no vapor space between seal and product—no moving parts—climate proof—noncorrodible—protects product from rim and lightning fires—operates from top to bottom of tank—entire circumference tightly sealed under pressure at all times.

For storing jet fuels, gasolines, sour crudes, light crudes, alcohol, naphthas, polyester or similar products, the Hammond Tubeseal System is the most efficient and positive seal known.

** Tubeseal system*

James P. O'Donnell Consulting Engineer

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proved to reduce vapor loss up to 50%

Downward velocity of air jetting into a tank through the breather vent causes currents which induce rapid product evaporation. S & J Air Baffle is a device which deflects incoming air into stratified layers above heavier, gas-rich air. The result is materially reduced surface boiling, with vapor losses cut from 25 to 50%. Unique Air Baffle design permits simple installation through the vent nozzle on tanks in service. Call or write for complete details and prices.

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GENERAL PRECISION EQUIPMENT CORPORATION GPE

SHAND AND JURS COMPANY

2600 Eighth Street, Berkeley, California

A Subsidiary of General Precision Equipment Corporation
Branch offices and representatives in principal cities

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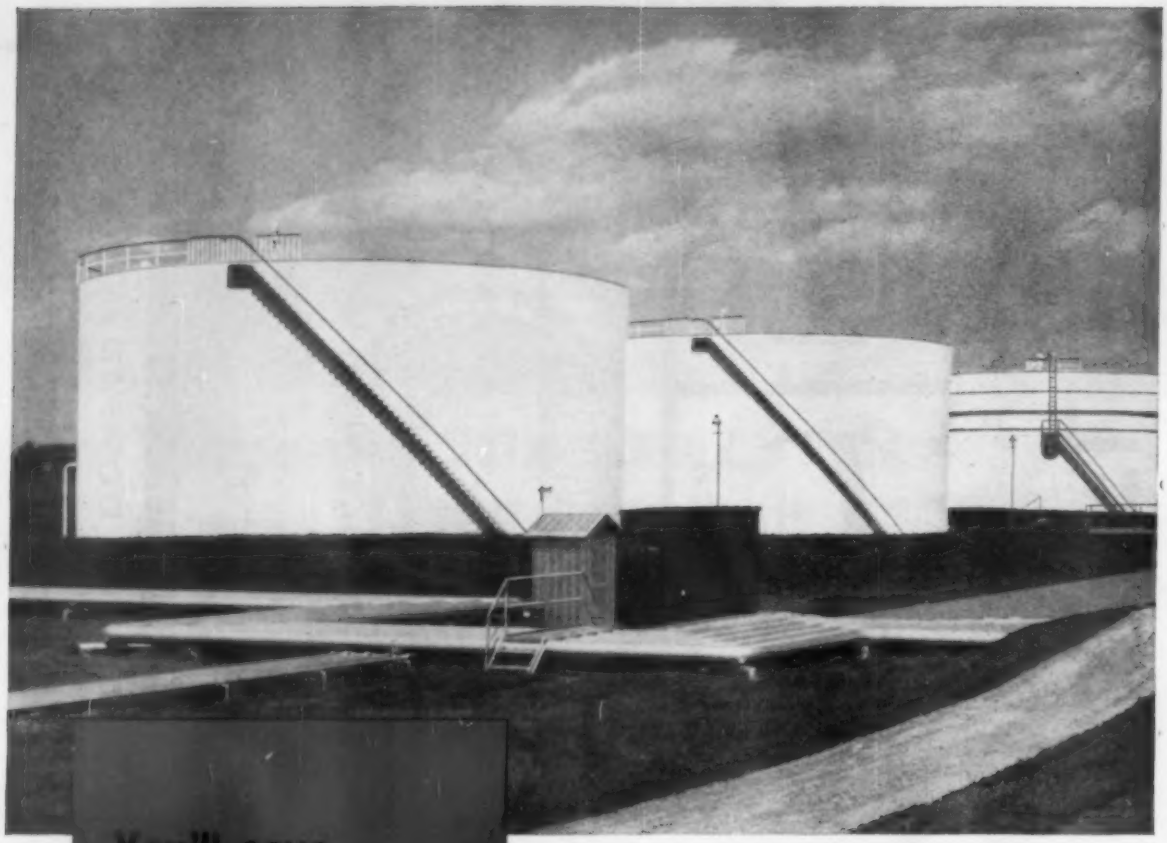

You'll save money two ways with Pittsburgh's Brilliant White

TANKHIDE®

1. More years of protection

2. Lower evaporation loss

For outstanding toughness . . . and economy, too . . . no other protective coating for gasoline and oil storage tanks equals the performance of Pittsburgh's brilliant White TANKHIDE.

● **Made with intensely white** titanium pigments and weather-resistant vehicles, TANKHIDE withstands the destructive effects of corrosion and weather. Self-cleaning action helps to maintain its gleaming whiteness throughout its long life.

● **White TANKHIDE** also provides unusually high solar heat reflectance. This reduces costly losses of volatile petroleum products stored in cone roof and floating roof tanks.

● **Our long experience** in producing finishes of all types for the petroleum industry can save you time and money. Write, wire or phone Pittsburgh Plate Glass Company, Industrial Finishes, 1 Gateway Center, Pittsburgh, Pa.

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PAINTS • GLASS • CHEMICALS • BRUSHES • PLASTICS

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Quiet...Pressure Vessels at Work

ENGINEERING

FABRICATION

FIELD ERECTION

Looks quiet, doesn't it?

Yet inside, this new refinery is pulsating with life—surging with activity to produce fuel for millions of thirsty carburetors.

And pressure vessels like those shown above are being built day-in, day-out at Solar Chicago. Meeting rigid and unusual specifications is simple for us. It's all in a day's work.

Whatever you need in pressure vessels, and whenever you need them, why not take advantage of our experience and "know-how".

We are geared to fill your needs promptly.

May we hear from you?

USI **Solar Chicago** DIV. U.S. INDUSTRIES, INC.

6400 W. 66th St., CHICAGO 38, ILL.

Telephone POrtsmouth 7-8900

FORMERLY CHICAGO STEEL TANK CO.

Eight 1664 cfm Fuller rotary units compressing to 120 psig in tandem sets to four 700 hp electric motors. Compressor plant supplies 13,200 cfm load to oil refinery—for tools, machinery, air lines and other pneumatic uses.

HOW FULLER ROTARY COMPRESSORS SAVE SPACE – CUT OPERATING COSTS,... at major eastern refinery

To save valuable space in the compressor plant, a large eastern oil refinery installed eight two-stage Fuller rotary air compressors—using a unique drive system. Because of the simple direct-drive through flexible couplings permissible with Fuller rotaries, the refinery was able to drive dual sets of compressors by single, 700 hp. electric motors.

While this means savings in space, the rotaries are also operating with cost-cutting efficiency.

In more than two years of service, these rugged compressors have required no down-time for repairs!

Simple design, rugged construction and precision manufacture are the "secrets" of Fuller rotaries' dependability. The only moving parts are rotor, blades and bearings. There is no reciprocating action—hence no vibration. Smooth, quiet operation permits installation on light-weight foundations, on upper floors—saving in weight, bulk and cost of installation.

For full details on the maintenance-free economy and high performance of Fuller rotaries, write today for comprehensive, illustrated Bulletin C-5A.

C-343
1348

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....pioneers in harnessing AIR

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132 Bridge St., Catasauqua, Pa.
SUBSIDIARY OF GENERAL AMERICAN TRANSPORTATION CORPORATION
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FULLER COMPANY GENERAL AMERICAN TRADE MARK

YOU GET A

BONUS

WITH EVERY

MIDWEST

"LONG TANGENT" ELBOW

21% to 42% MORE ELBOW AT NO EXTRA COST

It's a built-in bonus that comes right with the elbow . . . a tangent or straight section at each end of the fitting.* Benefits of this bonus . . . this extra value . . . are yours AT NO EXTRA COST because Midwest "Long Tangent" Elbows are PRICED THE SAME AS OTHER ELBOWS. It's a value you can't afford to miss.

For additional information, ask your Midwest distributor or write us for Catalog 54.

*Size 24" and smaller have tangents equal to ⅛ nominal pipe size; for example, 12" ell has 3" straight ends. Above 24" pipe size, all tangents are 6" long.

ADVANTAGES OF MIDWEST "LONG TANGENT" ELBOWS

- They save pipe.
- They often eliminate short nipples and their extra welds.
- They save time and money in lining up and clamping pipe and fitting.
- They make it easier to apply slip-on flanges.
- They remove the circumferential weld from point of maximum stress and can be sleeved.

THEY COST NO MORE THAN OTHER ELBOWS

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Main Office: St. Louis 3, Mo. (P. O. Box 433)
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MIDWEST
WELDING FITTINGS IMPROVE PIPING DESIGN AND REDUCE COSTS

To refiners who need more

HYDROGEN
FOR HYDROTREATING

Any refiner who needs more hydrogen can now arrange to make up the deficiency with generating facilities of his own.

Procon is prepared to design, engineer and build a hydrogen plant to suit your needs. Two types of packaged hydrogen plants, capable of utilizing a broad range of hydrocarbons as feed stocks, can be supplied. Catalytic Steam Reforming of light hydrocarbons forms the basis for one type. The other employs Partial Oxidation of heavy fuel oils. With either type, the plant will be designed to produce hydrogen of the purity needed for hydrotreating—and to provide maximum thermal efficiency.

Procon engineers will be glad to consult with you.

PROCON *Incorporated*

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PROCESSES AVAILABLE TO SUIT ANY REFINERY FEED STOCK

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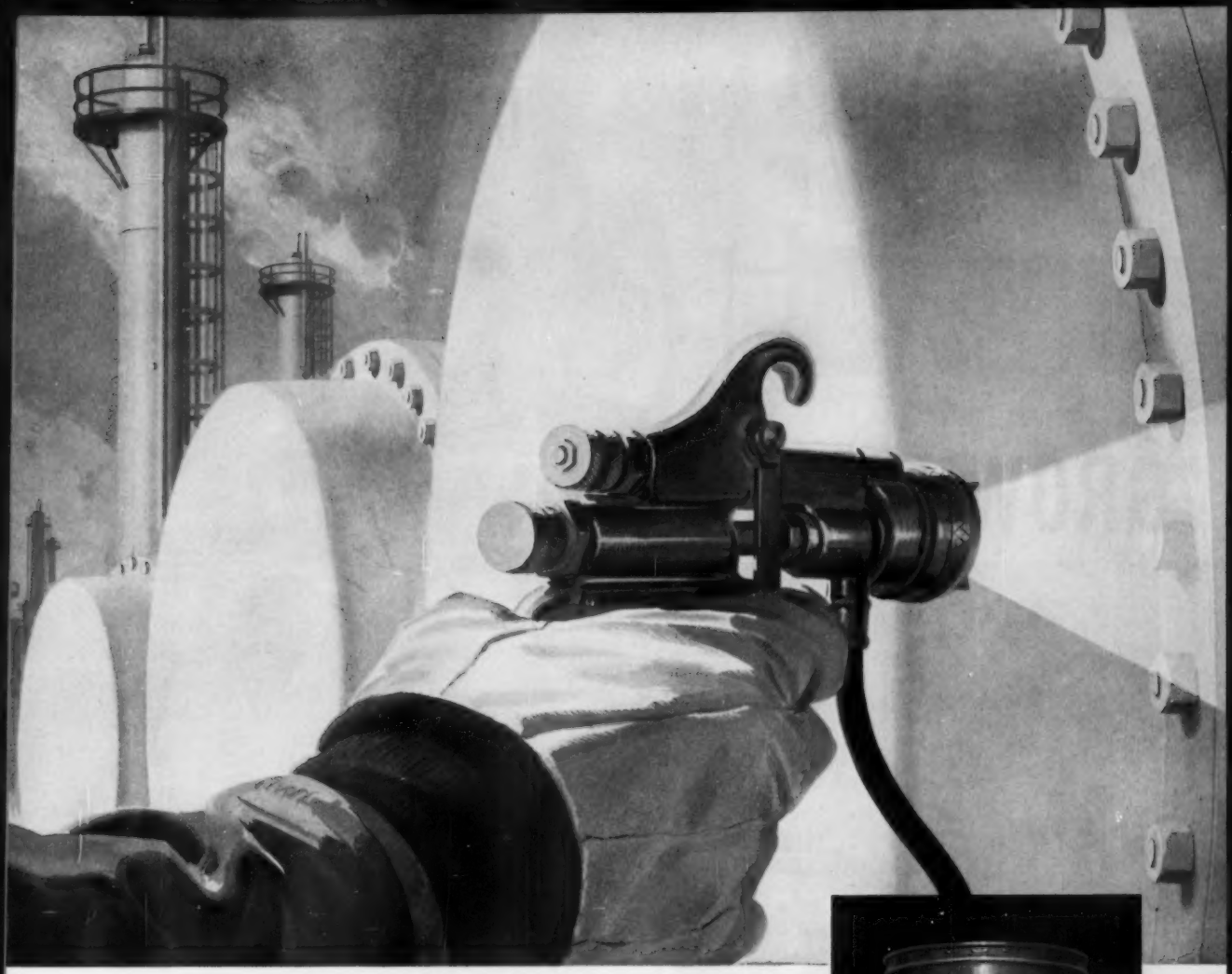

Humble Coatings Give You Three-Way Reduction in Maintenance Costs!

Humble coatings last six months to a year longer than most other paints. You save *two* ways — on paint and labor. The *third*, and most important, way you save is this: you get better protection, which means longer life for expensive equipment.

Humble coatings contain rust-preventing ingredients that not only provide surface protection, but also neutralize any corrosive elements that may penetrate the surface protection and attack the metal. These coatings were specially developed to give maximum protection in refineries and chemical plants where strong acids, alkalis and salt sprays produce severe corrosive conditions.

Without cost or obligation, one of Humble's trained engineers will make a thorough study of your needs and recommend a complete painting program for you. Call your nearest Humble representative, or phone or write:

HUMBLE OIL & REFINING COMPANY
Consumer Sales, P.O. Box 2180,
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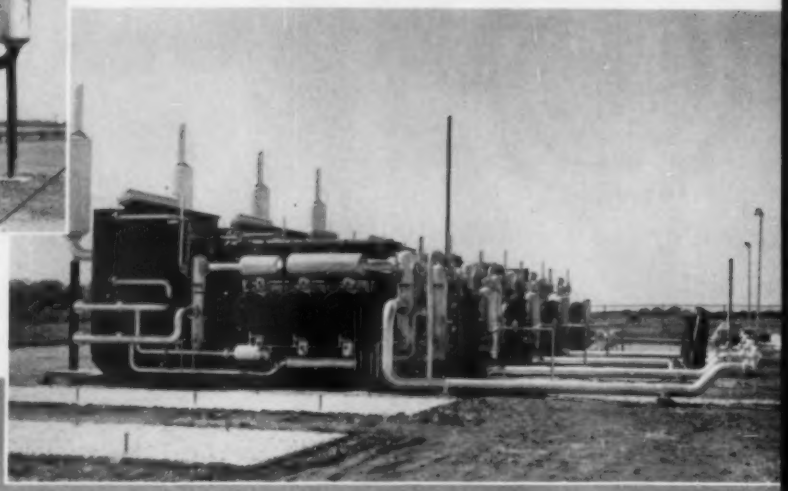
Humble's line of coatings includes —

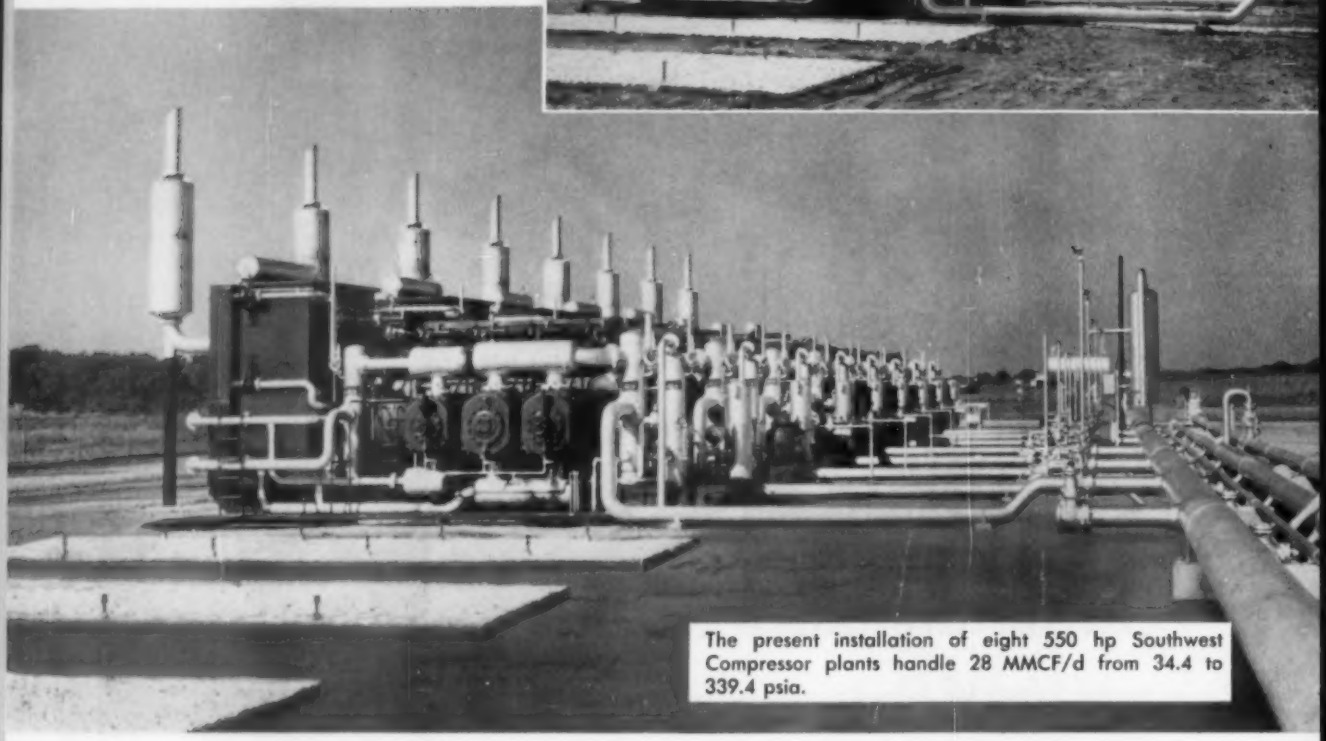
- RUST-BAN ®
- Vinyls
- Epoxies
- Acrylics
- Phenolics
- Enamels
- Tank coatings
- Hot surface coatings
- Interior and exterior emulsion-type paints

HUMBLE

GROWING...



GROWING...



The present installation of eight 550 hp Southwest Compressor plants handle 28 MMCF/d from 34.4 to 339.4 psia.

AND STILL ROOM TO GROW . . .

With Southwest compressor plants you have the exact horsepower you need when you need it. The photographs show the various stages in growth of the Continental Oil Co. Plant, West Short Junction Field, Oklahoma. It has grown in size as the need for increased compressing capacity has grown. It can continue to grow with no obsolesence, no major changes. Additional Southwest Compressor plants are added as required.

Southwest, code constructed compressor plants are fully factory assembled. They are mounted on heavy duty skid bases with cooling, air starting, lubricating, and automatic control systems installed. They are ready for installation months before conventional units. Because of the automatic controls and safety devices, operating costs per horsepower-hour are cut to a fraction of the costs of a fully attended installation. Ask Southwest engineers to consult with you on your compressing plant requirements. Available in sizes from 265 to 880 hp.

SOUTHWEST INDUSTRIES, INC.

P. O. Box 19392, Houston 24, Texas

NOW AN EVEN DOZEN

The 13th Southwest unit was started November 4, 1958.

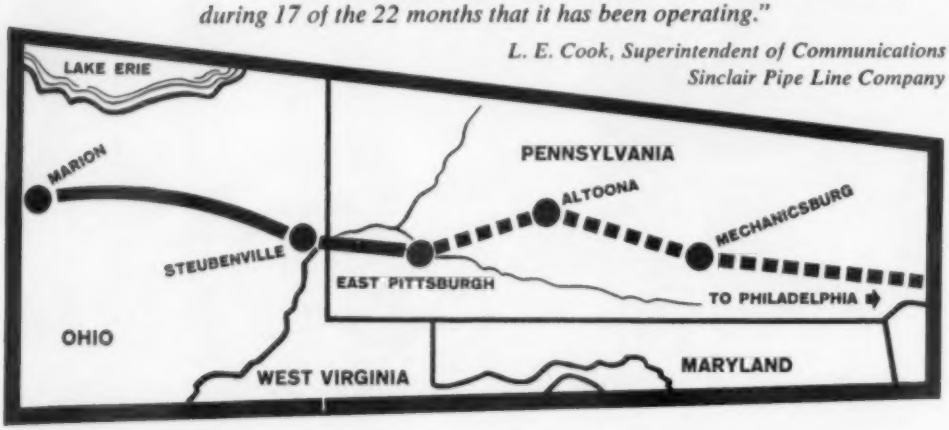
Southwest
PACKAGED COMPRESSORS

Designers and Manufacturers of Packaged Inert Gas Generators, Packaged CO_2 Removal Units, Packaged Gas Compressors, and Packaged Waterflood Plants.

Kellogg Microwave performs at 99.998% reliability!

"...this system has performed exceptionally well...100% continuity during 17 of the 22 months that it has been operating."

L. E. Cook, Superintendent of Communications
Sinclair Pipe Line Company



Only five outages in the 22 months of service this Kellogg PTM Microwave System has been in operation for Sinclair Pipe Line Company, and only two of these totalling 2 hours and 51 minutes caused by the microwave equipment. That's 99.998% reliability, far superior to physical circuits!

Sinclair's dual path system was inaugurated on October 13, 1956. The present system stretches 200 miles from Marion, Ohio, to East Pittsburgh, Pennsylvania. It features 8 channels, 2 terminal stations, and 7 repeaters. All intermediate stations have drop equipment. At East Pittsburgh, circuits are joined by similar Kellogg 10C PTM systems extending eastward to Mechanicsburg then to Philadelphia.

Sinclair's dual path operation between East Pittsburgh and Marion, Ohio has many advantages over conventional systems, principally the elimination of all switch-over equipments or circuits. A failure of one of the units will not interrupt traffic, hence there is no traffic time loss as a result of switching to standby. There is increased reliability since both operating units are continuously monitored for condition of operation. Space or frequency diversity equipments may be operated with a minimum of additional components. In addition to this high degree of reliability and continuous performance, Sinclair reports that "the signal-to-noise measurements have exceeded the original calculations and the system has provided excellent performance since the inaugural date of operation."

The Kellogg Model 10C-2 PTM Microwave System now features up to 45 channel multiplexing equipments. Channels are readily arranged to suit the needs of specific installation whether for telemetering, remote control, data and voice transmission. Our engineering staff is always at your service ready to discuss your communication problems.

Kellogg Switchboard and Supply Company, 6650 South Cicero Avenue, Chicago 38, Illinois. Communications Division of International Telephone and Telegraph Corporation.

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Why Kellogg PTM Is Setting New Performance Standards:

Microwave has made huge strides since first pioneered by International Telephone and Telegraph Corporation in 1931. Here are 10 reasons why Kellogg's Pulse-Time Modulation Microwave, perfected by ITT research, is inherently superior.

1 Easy maintenance, particularly of the RF equipment; visual test and check methods may be used.

2 Tubes may be changed at random *without* realigning the Intermediate Frequency Amplifier.

3 Where propagation is a problem due to multi-path cancellation, it is simple to install space diversity reception equipment.

4 Drop channels may be installed at random, without need to demodulate entire groups to audio.

5 Economical system design: drop and insert channels may extend only throughout those parts of the system where required, and not the entire length.

6 Maximum transmitter tube life; tube life averages approximately 15,000 hours for 2C39s.

7 All PTM channels are interchangeable, only one spare is required.

8 High signal-to-noise ratio: the inherent noise of each channel is "clipped" out. Each terminal and each repeater station transmits a fresh signal.

9 Less tower rigidity required for accurate signal transmission at 2000 mc.

10 Plug-in channel units feature printed circuitry replacing tubes with crystal diodes; demodulators semi-passive, one tube per channel; modulators passive, no tubes. Results in 4:1 reduction in the number of tubes and 5:1 reduction in power consumption.

Investigate these and other advantages of a Kellogg PTM Microwave system. Write for complete details.

They Say—

Too many floods burning

Dear Sir:

We would refer you to the article entitled "Thermal Methods Provide Three Ways to Improve Oil Recovery" in your edition of January 19, page 86, and request clarification of the following point:

In the sketch map at the bottom of page 93, two black dots indicate oil-recovery projects in Wyoming, but reference to your schedule on page 92 does not indicate that, in fact, these locations do exist.

B. Pass
Secretary-Treasurer
Sapphire Petroleums
Toronto.

(Editor's note: The Wyoming projects have been proposed but are not under way. The map on page 93 was intended to show proposed, active, and completed units. Because of a punctuation error it seems to indicate only active and completed projects.)

B.t.u. a bad price yardstick?

Dear Sir:

I have read with interest your editorial on page 57 of the January 19 issue.

I am wholeheartedly in sympathy with the proposition that both gas and oil should be priced at levels which will provide adequate exploratory incentives and which will permit the replacement of production by equivalent new reserves without undue financial hazards.

The gas utility industry, of course, attempts to do the same thing, with indifferent success in some states because of regulatory commission attitudes, by requesting that rate of return be computed on fair value of plant (or reproduction cost.)

However, I wish to protest vigorously the statement that the industry is selling energy in the form of gas at only 1/5 its price as crude. After relatively minor processing, natural gas is ready for sale in inherently the same condition as it was produced.

On the other hand, crude oil requires major processing and a wide multitude of products are obtained with the price for the products being dependent upon their peculiar characteristics and not upon their energy content in many cases. Furthermore, many of these products are used for purposes not competitive with natural gas (gasoline, lubricating oils, etc.)

It is, therefore, inappropriate to use B.t.u. as the basis for comparison in price between the two products or to use it as a basis for allocation of costs as some oil companies have attempted to do in proceedings before the Federal Power Commission. The only advantage which it has is one of simplicity and simplicity should never be considered as a substitute for correctness.

Daniel Parson
Director, Bureau of Statistics
American Gas Association
New York

OCAW isn't Baytown union

Dear Sir:

On pages 60-61 of your January 19 issue, you have a listing of refineries covered by OCAW contracts. Included in this tabulation is the Baytown refinery of Humble Oil & Refining Co.

This is in error. The OCAW is not now, nor has it ever been, the bargaining agent for Humble's Baytown employes. Instead, our hourly rated employes at Baytown are represented by four other bargaining agencies: The Baytown Employees Federation, the International Association of Machinists, the International Brotherhood of Electrical Workers, and the Brotherhood of Railroad Trainmen.

Of the some 4,000 Humble employes represented by these unions, the great majority (3,650 employes in process and maintenance work) are represented by the Baytown Employees Federation.

G. A. Mabry
Manager, Advertising and Public Relations
Humble Oil & Refining Co.
Houston

An explanation would help

"There will be a new effort in Congress next year to reduce the 27.5% oil depletion tax allowance. The effort may be strong enough to succeed despite opposition by an administration, aligned with powerful oil interests.

"This raises the question of strategy on legislation to create similar depletion allowance for oil shale.

"Does oil shale need the same amount of depletion allowance to be able to compete with petroleum? Should it be more? What are the chances of success in getting any shale

HOMCO hits the spot

HOUSTON OIL FIELD MATERIAL COMPANY Inc

HOMCO OFFERS A COMPLETE 24-HOUR SERVICE ANYWHERE ANYTIME

Research — Engineering — Development — Manufacturing

Drilling under towns

Drilling under mountains

Drilling under lakes

Drilling offshore from land

Drilling several holes from one platform

These are typical of the many applications of HOMCO Directional Drilling. Other uses are:

- **Drilling through faulting formations.**
- **Straightening or sidetracking a hole.**
- **Drilling through multiple sands.**
- **Relief drilling, for wells on fire or out of control.**
- **Contacting an oil pool under the over-hang of a salt dome.**
- **Close lease-line drilling.**
- **Correcting irregular bottom hole spacing for proper drainage.**
- **Re-drilling old wells for new production.**

- **Whipstocks**
- **Spud bits**
- **Combination Jar and Key-Seat Reamers**
- **Deflecting Tools**
- **Replaceable Blade Stabilizers**
- **Reamers**
- **Hole Openers**

Sidetracking
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THE OIL INDUSTRY'S MOST *Complete* SERVICE

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Mexico City, Mexico
Long Beach, California
Maracaibo, Venezuela
Paris, France

THE WORLD'S LARGEST INDEPENDENT OILFIELD SUPPLY AND SERVICE ORGANIZATION

depletion when the petroleum depletion is being cut? These are a few of several questions oil-shale interests must answer in coming months.

"The decision might be to sit out the petroleum controversy and decide what move to make after the course of petroleum depletion is clear."

Editorial in the Grand Junction, Colo., Daily Sentinel.

Dear Sir:

The editorial (above) appeared December 8. This paper is the most widely read of any published between Denver and Salt Lake City and considers itself the public spokesman for the oil-shale industry.

Local oil men have attempted to explain to their editorial writers that the depletion allowance was set up to encourage exploration, and that it is not a subsidy for marginal mining or refining operations. Depletion is certain to be in for a rough ride in our new Congress and this type of editorial is certainly not helpful to a public already confused.

I would like to offer a suggestion which might help to improve this situation. Interested oil business publications are in a position to do the industry an important service at nominal cost by forwarding reprints of suitable articles on depletion and similar subjects to a selected list of newspaper business editors.

Using the local petroleum committees of various states to distribute and explain the reprints might improve their distribution and add a personal touch not possible through mail delivery.

D. James Edson, Jr.
Mincon Geological Consultants
Grand Junction, Colo.

(Editor's note: It would also help if more oil men would do what those in Grand Junction did.)

Letters to They Say should be addressed to The Editor, The Oil and Gas Journal, Box 1260, Tulsa, Okla.

CALENDAR

FEBRUARY

15-19 American Institute of Mining, Metallurgical, and Petroleum Engineers, annual meeting, Sir Francis Drake Hotel, San Francisco.

16-18 American Management Association, seminar on management problems of exploration and production, Hotel Astor, New York.

18-21 National Society of Professional Engineers, winter professional meeting, Dinkler-Tutwiler Hotel, Birmingham, Ala.

24-25 University of Oklahoma, sixth geological symposium, Norman, Okla.

24-26 Oklahoma State University, natural-gas engineering conference, Stillwater, Okla.

25 Petroleum Equipment Suppliers As-

STRAN-STEEL BUILDINGS—NOW IN COLORS!

Functional as it is attractive, Stran-Master provides custom-fitted space for warehousing, manufacturing, service and office use.

CHOICE OF 6 COLORS ON LOW-COST Stran-Master

New factory-applied color makes Stran-Master the best buy on the market for economical commercial and industrial buildings. These low-cost, all-steel structures are now available in your choice of six attractive colors: blue, bronze, green, gray, rose, and white. Stran-Satin Colors won't sun-fade, peel or blister . . . two long-lasting layers of vinyl-aluminum coating are baked on to preserve Stran-Master's handsome appearance for many maintenance-free years.

You'll find the Stran-Master a quality-engineered building that facilitates quick construction, allows flexibility in size and layout, and can be custom designed to fit your particular operation. Finance it over a 5-year period with as little as 25% down on Stran-Steel's purchase plan. For full details clip the coupon or contact your nearest Stran-Steel dealer. He's listed in the Yellow Pages under *Steel Buildings* or *Buildings—Steel.*

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SIOUX impact offer Torque

BIG "SLUGGERS!"

The SIOUX No. 320 and 322 air impact wrenches achieve a new high in power to weight ratio. Certified torque as shown in specifications with 8 points of power selection makes them most ideal for heavy duty work.

More than MEDIUM!

No. 315 and 316 are popular industrial and general use sizes with great versatility of use and power for extra punch. They're designed for use where power is required beyond that of conventional ½" drive wrenches.

Medium POWER

No. 315 and 316 cover a torque range adequate for many purposes. They're thoroughly tested and proven. Thousands are in daily use.

SIOUX *Electric* IMPACT WRENCHES

Sioux electric impact wrenches offer equal power in right or left hand rotation. The torque for each wrench is stated and certified. Their mechanical design offers exactly the same advantages as that of the air wrenches. Their exclusive reverse cap switch lock prevents reversing with the current on, and eliminates burning commutator brushes and switch contacts. They are unexcelled in performance.

wrenches

for every task!

CERTIFIED SIOUX POWER

SIOUX tells you the torque your air or electric impact wrench will deliver. (See specifications.) You don't buy just a wrench. You buy certified SIOUX power! Reversible power. And on air wrenches controllable power through eight point power selector.

PROVEN EFFICIENCY

Here, the advantage of the exclusive SIOUX mechanical design is revealed! You can expect your SIOUX air impact wrench to deliver *25% more torque* while *consuming 30% less air!* Less power is absorbed by the wrench itself. More is applied to the drive!

FIELD TESTED, TIME TESTED PROVEN DEPENDABILITY

The exclusive SIOUX impact wrench mechanical design has passed the toughest test of all . . . the test of time. Thousands have been giving dependable, trouble-free service for years.

REACTION BALANCED for Less Vibration Feedback

All SIOUX Impact Wrenches are "reaction balanced" for less vibration and torque feedback and for minimum operator fatigue. You can feel the difference!

ANGLE ATTACHMENT— used directly on the square of the impact wrench to reach those hard to get at spots.

Production type No. 313, 314!

AIR IMPACT WRENCHES

These models feature an exclusive remote air exhaust that takes exhaust 6 feet from the operator. Quiet, clean operation. Production type design with paddle switch, and 8 point torque selector.

No. 303 AIR IMPACT SCREWDRIVER

Same as above except takes ¼" hex drive shanks for clutch head, Reed and Prince, standard, and Phillips screwdriver bits, and for Allen type socket heads.

Compare the TORQUE! the QUALITY!

Cat. No.	AIR Square Drive	Cap. Bolt Size	Torque Ft. lbs. at 90 lbs. Air Pressure at Tool
313	3/8"	3/8"	60
314	1/2"	7/16"	75
303*	1/4" Hex		
315	1/2"	5/8"	130
312*	7/16" Hex		
316	1/2"	5/8"	195
317	5/8"	5/8"	195
318	5/8"	3/4"	250
319	5/8"	7/8"	425
320	3/4"	1"	750
322	1"	1 1/8"	1000

*AIR SCREWDRIVER

Cat. No.	ELECTRIC Square Drive	Cap. Bolt Size	Torque Ft. lbs. in 10 sec. operation Right or Left
323	3/8"	7/16"	75
333	1/2"	7/16"	75
325	1/2"	5/8"	125
330	1/2"	5/8"	175
335	5/8"	5/8"	175

ALSO NO'S. 260, 262, 242, 246 ELECTRIC SCREWDRIVERS

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REWARD

Startling claim . . . but it's true! You'll find the revolutionary Hartzell Controllable Pitch Fan will reward you with continuous operating efficiency and economy in many ways and for many years to come. Here's how!

COOLING MAGIC is accomplished by variable blade pitch settings that are instant and automatic. The fan holds outlet temperature fluctuation to ±1½° F by increasing or decreasing blade pitch as the cooling requirements change.

UP TO 50% POWER SAVING. Because the pitch of the fan blades is rarely at a maximum, considerable savings in power consumption is made. In fact, a Hartzell Controllable Pitch Fan may save more than enough in power to pay for itself.

COMPLETE SIZE RANGE from 7 to 12-foot diameters in four and six blade assemblies are made from Hartzite plastic, a Hartzell exclusive, and aluminum—available in 7 to 10-foot diameters.

So if you want to be REWARDED with efficiency and economy for years to come, call on your Hartzell field engineer, or write for bulletin A-111B on Hartzell Controllable Pitch Fans for heat exchangers. You'll be glad you did.

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PROPELLER TYPE FANS AND BLOWERS • ROOF VENTILATORS • UNIT HEATERS • ENGINEERING OFFICES IN PRINCIPAL CITIES

sociation, Mid-Continent and Rocky Mountain district meeting, Mayo Hotel, Tulsa.

26 American Society for Testing Materials, southwest district annual meeting, Houston.

26-28 Pipe Line Contractors Association of Canada, fifth annual convention, Castle Harbour Hotel, Bermuda.

27 Natural Gasoline Association of America, Permian basin regional meeting, Scharbauer Hotel, Midland, Tex.

MARCH

5 Petroleum Equipment Suppliers Association, Pacific district, annual membership meeting, Ambassador Hotel, Los Angeles.

4-5 University of Oklahoma, gas-processing conference, Norman, Okla.

4-6 American Petroleum Institute, Division of Production, southwestern district meeting, Hotel Scharbauer, Midland, Tex.

5-6 Southern Gas Association, transmission management conference, Jung Hotel, New Orleans.

6 Natural Gasoline Association of America, Gulf Coast regional meeting, Robert Driscoll Hotel, Corpus Christi, Tex.

7 American Chemical Society, Oklahoma tetrasectional meeting, University of Tulsa, Tulsa.

8-11 American Society of Mechanical Engineers, gas turbine power conference and exhibit, Netherlands-Hilton Hotel, Cincinnati.

9-11 Midwest Gas Association, annual meeting, Hotel Fort Des Moines, Des Moines.

11 Petroleum Equipment Suppliers Association, southwestern district, annual membership meeting, Shamrock Hilton Hotel, Houston.

13 American Institute of Chemical Engineers, Sabine area section; American Chemical Society, Texas-Louisiana Gulf section; sixth annual joint technical meeting, Lamar State College of Technology, Beaumont, Tex.

16-18 Western Petroleum Refiners Association, forty-seventh annual meeting, Hilton Hotel, San Antonio, Tex.

16-19 American Association of Petroleum Geologists, Society of Economic Paleontologists and Mineralogists, forty-fourth annual meeting, Memorial Auditorium, Dallas.

16-20 National Association of Corrosion Engineers, fifteenth annual conference, Hotel Sherman, Chicago.

17-18 Manufacturing Chemists' Association, air and water-pollution abatement conference, Netherlands Hilton Hotel, Cincinnati.

18 Petroleum Equipment Suppliers Association, eastern district, annual membership meeting, Duquesne Club, Pittsburgh.

19-20 New England Gas Association, annual meeting, Hotel Statler, Boston.

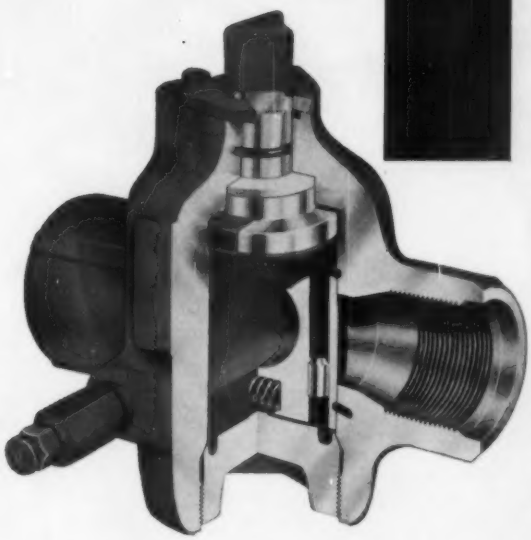
21 North Texas Oil and Gas Association, twenty-ninth annual meeting, Kemp Hotel, Wichita Falls, Tex.

23-24 University of Oklahoma, second conference on theory of fluid flow through porous media, Norman, Okla.

25-27 American Petroleum Institute, Division of Production, southern district meeting, Roosevelt Hotel, New Orleans.

31 Seventh annual meeting, Philadelphia-Wilmington section of American Institute of Chemical Engineers, and University of Pennsylvania, Philadelphia.

29-Apr. 2 American Society of Mechanical Engineers, instruments and regulators



Cut-away Mission Valve

MISSION

the valve that thinks for itself!

Here's a valve that knows exactly what to do:
The higher the pressure, the more tightly the valve seals. And it's as simple as this—line pressure forces Mission Sealant through two semi-circular grooves around the downstream port, sealing like a plastic packing, to form a gas-tight seal. Leaks are stopped automatically *before* they can start.

Two split cylindrical cores, acting like a gate, are wedge-proof, allow easy opening and closing even under pressure. Only the downstream core is pressed against the body by line pressure. The upstream half is held lightly in place by springs. Core friction is thus cut in half.

The complete line of 315 Mission Valves brings these positive advantages of easy opening and tight sealing to practically all valve applications. This wide selection, the Mission Guarantee, and the Mission Renewal Policy combine to make Mission Valves your best and most economical buy.
Specify Mission and eliminate your valve problems.

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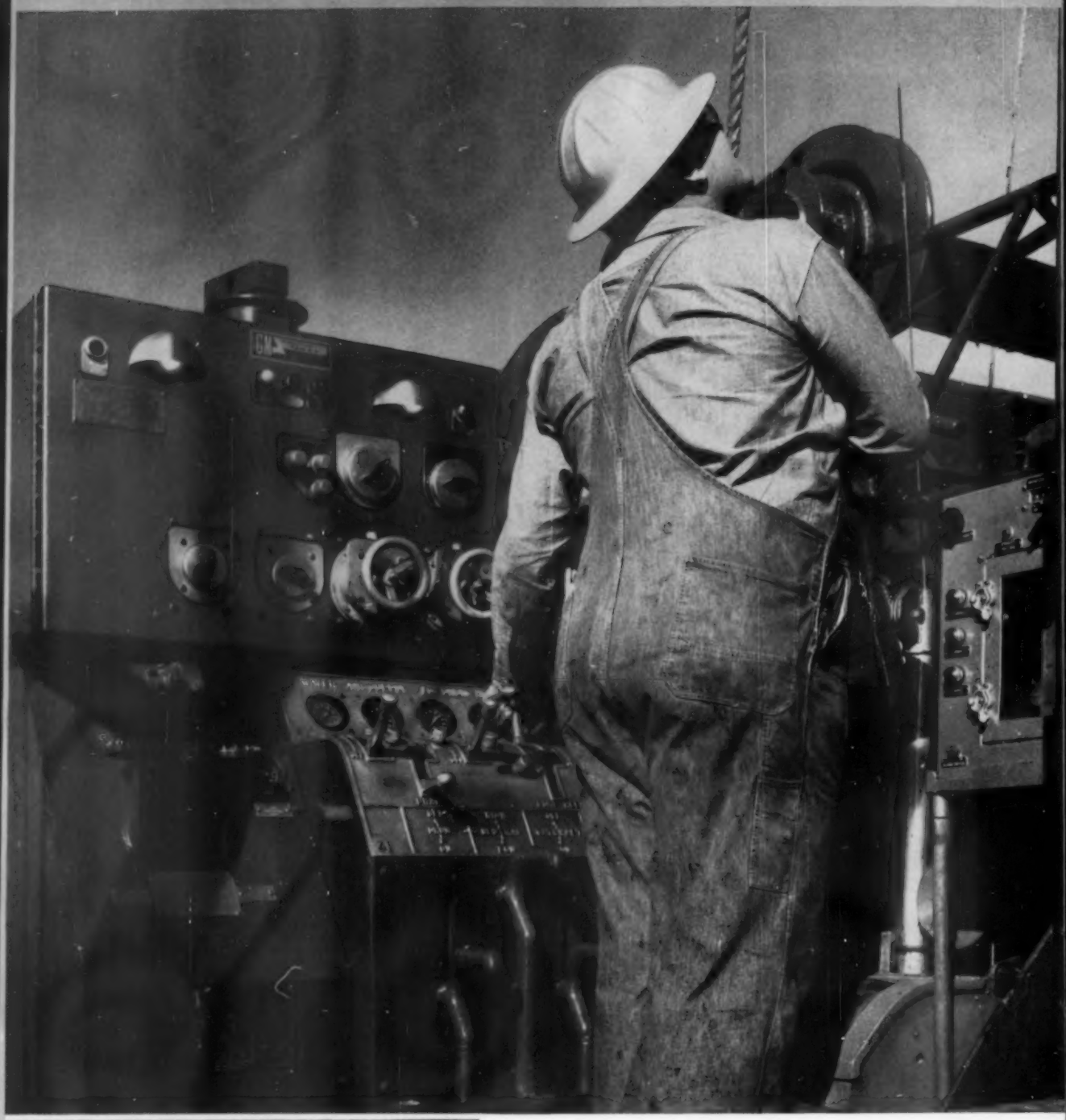
About Electro-Motive Power on Movible No. 2—



Control center is located beside draw works. D. W. Goodyear, driller, stands beside Electro-Motive control console that provides complete control of all Diesel-electric equipment.

Movible Offshore Company Rig No. 2 as it looked in November in West Cameron Area. Rig was launched in September 1957. Platform is designed to drill in depths up to eighty feet. Submersible structure measures 200′ by 200′.

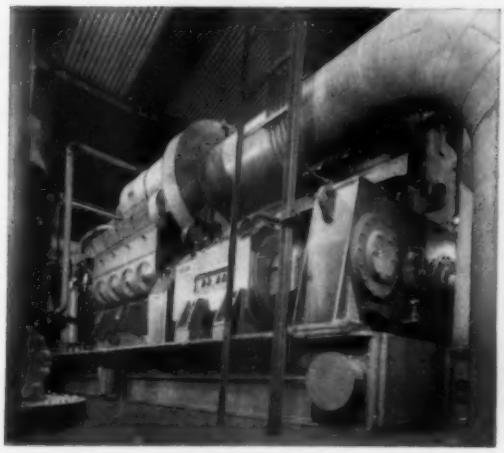
"IT'S GOT THE FEEL OF STEAM...PLUS ONE COMPANY SERVICE"

In less than fifteen months time, Movible Offshore's Rig No. 2 has drilled an impressive 90,000 feet of hole. Though superintendent R. L. "Ray" Meadows is an old steam man, he has this to say about Electro-Motive Power: "It's got the feel of steam, it's flexible and has all the reserve extra power needed for any emergency".

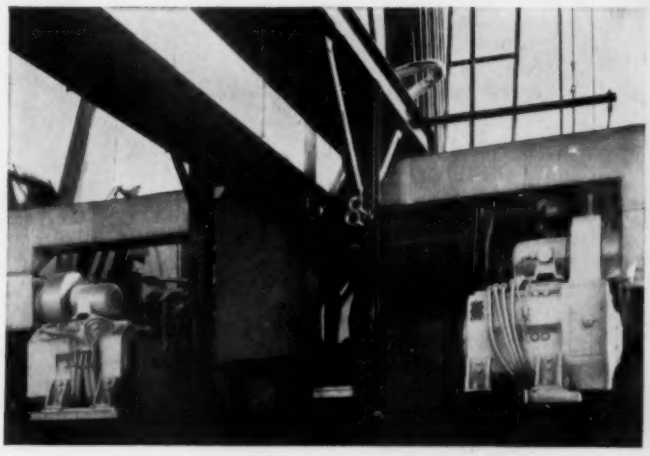
When Ray Meadows refers to "one company service", he means that Electro-Motive is responsible for the complete power system. One source for service and parts on both engine and electrical components.

Probably the most valuable part of Electro-Motive service is what Ray calls "willingness to help". In one instance, an idea by Movible with an assist from Electro-Motive effected a substantial cost savings.

Before you decide on any drilling power, see your Electro-Motive representative. Let him tell you about this equipment. After that, you will know why more offshore rigs use Electro-Motive Power than any other Diesel-electric system.



Engine room on Movible No. 2 is compact and neat. Three Electro-Motive engine sets, each driving two d.c. generators, supply power to drive all motors. Current Electro-Motive model SR-10 is rated at 1,000 horsepower.



Two Electro-Motive drive motors are used to power the draw works. Similar drive motors are used on mud pumps and rotary. Interchangeability of parts between all drive motors and generators provides savings on maintenance and service.

ELECTRO-MOTIVE DIVISION · GENERAL MOTORS

LA GRANGE, ILLINOIS • *In Canada:* **General Motors Diesel Limited,** London, Ontario

Petroleum Industry Sales Offices: Houston, Texas; Los Angeles, California

HOW OLD HOLE WAS DEEPENED OVER 1000' THROUGH 5½" CASING

HYCALOG

with V-Door bits PATENT APPLIED FOR

CONTINUING RESEARCH FOR LOWER COST DRILLING

Drilling through small diameter casing in a recent Mississippi deepening program demonstrated further the economy of using HYCALOG V-DOOR diamond bits.

In the run from the old total depth of 10,109' to the new completion depth of 11,200' only three 4 11/16" bits were required. The first, going in the hole on Nov. 23 made 385 feet through shale in 93 hours, averaging 4.4 feet per hour. The second, gnawing its way through 513 feet of shale, anhydrite and sand, averaged 3.6 feet per hour. The third completed the well on Dec. 7 after making 193 feet at an average of 4.8 feet per hour in hard sand and shale in the Rodessa formation.

The three diamond bits replaced many times that number of conventional bits, *yet cost no more* . . . the number of trips was reduced proportionately, . . . rate of penetration was exceptionally good . . . and, in spite of the small diameter at that depth, it was a clean operation without any down time.

This is just one of a number of such records set by HYCALOG V-DOOR *bits. Why not let* V-DOORS *set a record on your next drilling program?*

Hycalog, Inc.

505 AERO DRIVE
SHREVEPORT, LOUISIANA

BRANCH OFFICES IN PRINCIPAL OIL PRODUCING AREAS

DIAMOND CORING • DIAMOND BITS • WELL LOGGING • CORE ANALYSIS

division conference, Case Institute of Technology, Cleveland.

APRIL

2-3 Society of Petroleum Engineers of AIME, Rocky Mountain petroleum section, Casper, Wyo.

2-3 American Institute of Mining, Metallurgical, and Petroleum Engineers, technical conference on stress corrosion, Mellon Institute, Pittsburgh.

2-6 Geological Society of America, Cordilleran section, annual meeting, University of Arizona campus, Tucson.

5-10 American Chemical Society, national meeting, Boston.

5-10 Engineers Joint Council, nuclear congress, Cleveland Auditorium, Cleveland.

6-7 Instrument Society of America, second national symposium on chemical and petroleum instrumentation, St. Louis.

7-8 Sixth Gas Compressor Institute, sponsored by University of Kansas and Southwest Kansas petroleum industry, Randall's Cafeteria, Liberal, Kans.

8-10 American Petroleum Institute, Division of Production, eastern district meeting, Penn-Sheraton Hotel, Pittsburgh.

14 Independent Oil Men's Association of New England, annual meeting, Hotel Statler, Boston.

14-16 Southwestern Gas Measurement Short Course, University of Oklahoma, Norman.

15-17 National Petroleum Association, semiannual meeting, Hotel Cleveland, Cleveland.

15-17 American Petroleum Institute, Division of Transportation, annual tanker conference, Jung Hotel, New Orleans.

16-17 Rocky Mountain Oil and Gas Association, midyear meeting, Casper, Wyo.

18-22 Petroleum Equipment Suppliers Association, twenty-fourth annual meeting, Boca Raton Hotel and Club, Boca Raton, Fla.

19-23 American Society of Mechanical Engineers, oil and gas power conference and exhibit, Shamrock-Hilton Hotel, Houston.

22-24 American Petroleum Institute, Division of Production, Mid-Continent district meeting, Herring Hotel, Amarillo, Tex.

22-24 Natural Gasoline Association of America, thirty-eighth annual convention, Baker and Adolphus Hotels, Dallas.

23-24 Sixth annual West Texas oil lifting short course, Texas Technological College, Lubbock, Tex.

24-25 Society of Economic Paleontologists and Mineralogists, Pacific Coast section, annual spring field trip, Boulder Creek area of Santa Cruz Mountains, California.

26-28 Texas Independent Producers and Royalty Owners Association, membership meeting, Baker Hotel, Dallas.

27-28 Society of Exploration Geophysicists, annual midwestern meeting, Cortez Hotel, El Paso, Tex.

29-30 Western Petroleum Refiners Association, Southwest regional technical-industrial relations meeting, Hotel Paso del Norte, El Paso.

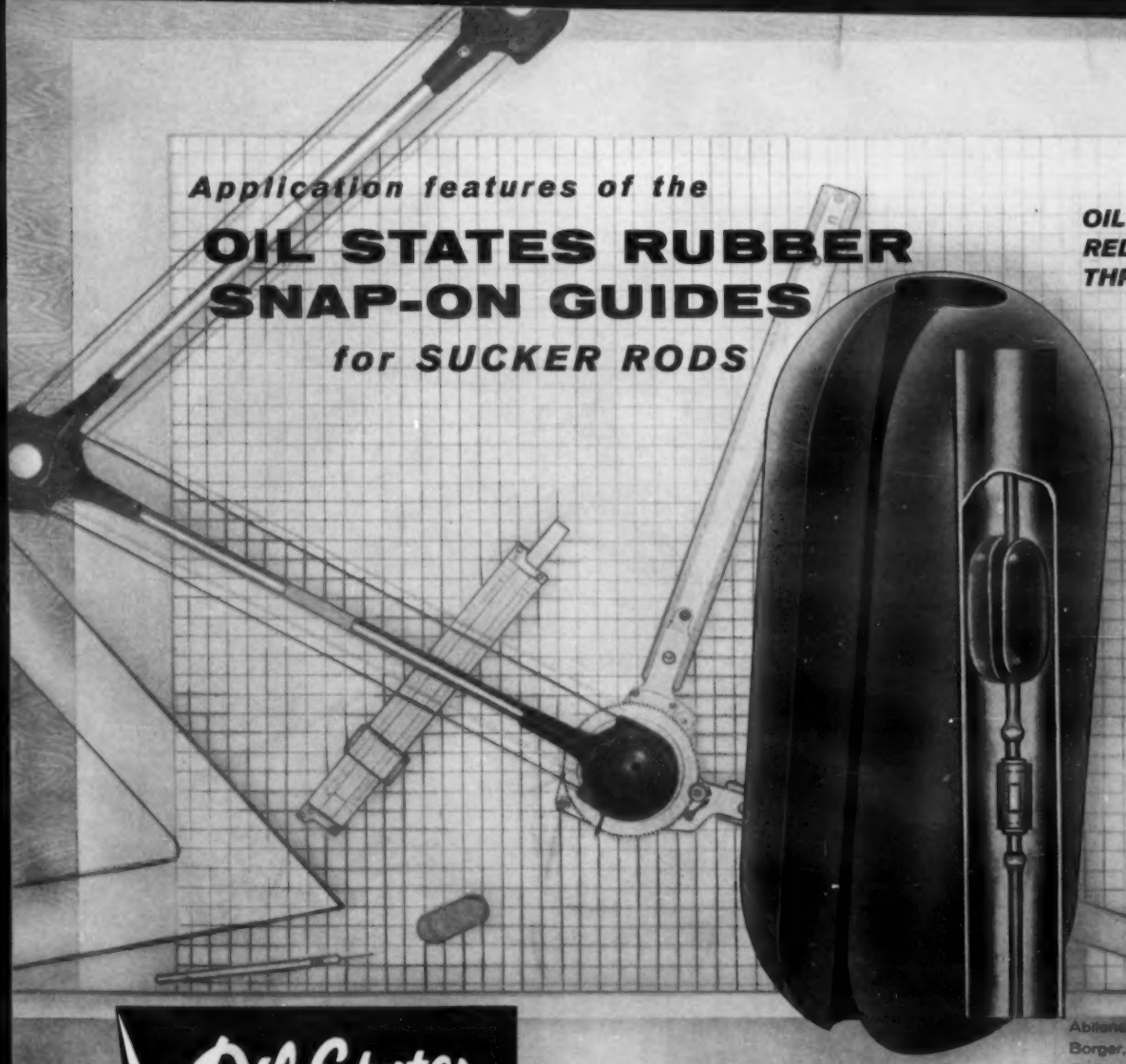
29-30 Pacific Coast Gas Association, operating section, transmission conference, El Mirador Hotel, Palm Springs, Calif.

30-May 1 American Petroleum Institute, Division of Production, Pacific Coast district meeting, Biltmore Hotel, Los Angeles.

Application features of the

OIL STATES RUBBER SNAP-ON GUIDES

for SUCKER RODS



OIL STATES RUBBER SNAP-ON GUIDES REDUCE OPERATING COSTS THROUGH THESE APPLICATIONS--

- Used in crooked holes or directionally drilled wells, to minimize wear on rods and tubing.
- Prevention of metal-to-metal contact in *any* well, giving low-friction bearing surfaces, with less power needed to lift the same amount of fluid.
- Lessens wear on the pump, by installing several SNAP-ON GUIDES just above the pump to deaden rod whip.
- Installed closely spaced in paraffin deposit zones, so that the SNAP-ON GUIDES will overlap on the stroke length, preventing paraffin deposit build-up.
- To prevent wear on rods in wells with low polish rod loads on the downstroke, as when "plunger" pumps are used, by eliminating rod bending inside the tubing.

Sold Through Supply Stores Only

THE OIL STATES RUBBER SNAP-ON SUCKER ROD GUIDE
Patent No. 2,604,364

Contact your local OIL STATES Field Representative for analysis and recommendations for your particular well requirements. It costs you nothing for this professional analysis and it may save you thousands of dollars in rod replacements and service costs.

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In Canada: Edmonton, Alberta
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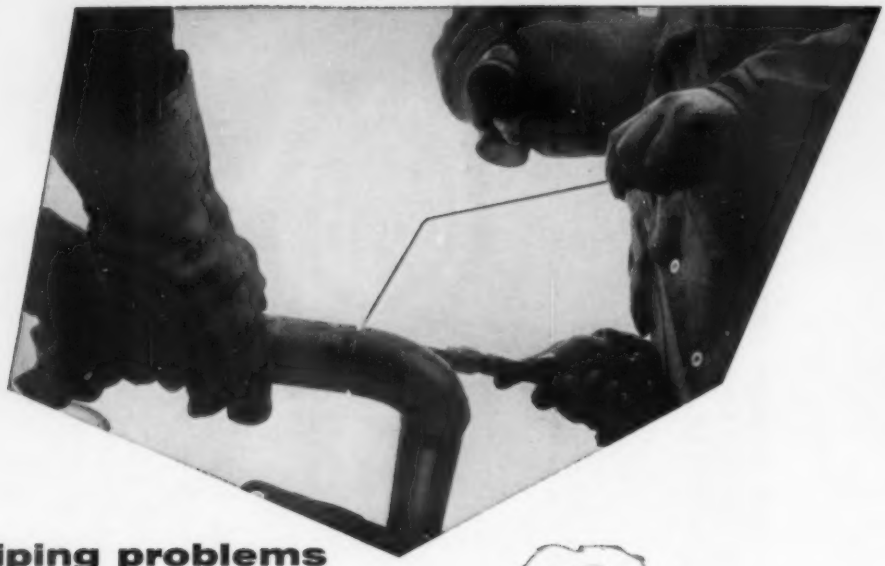

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"I'm in charge of scheduling, and coordinate buying and delivery with our fabricating needs. I find that when the specs call for an alloy system, I can depend on B&W to meet our requirements for welding fittings, flanges and pipe. I get matched piping and fittings with one call and one order — all from one responsible source."

B&W Welding Fittings, Flanges and Pipe are manufactured in the intermediate chromium-molybdenum alloys and stainless steels (B&W CROLOYS) in a wide range of sizes. They are available through B&W District Sales Offices and any qualified distributor. Write for Bulletin FB503.

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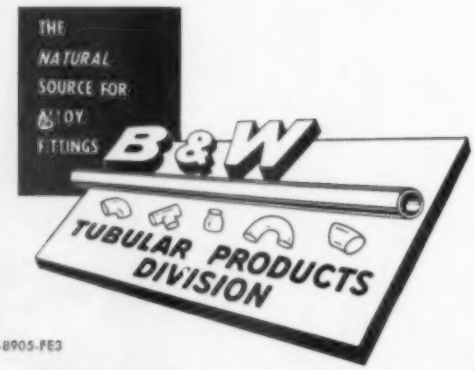

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JOURNALLY SPEAKING

Page 10 SUNDAY GHIBLI

"I know Kipling by heart"

Lost Oilman Fired Very Lights, Read Poetry In Week-Long Desert Vigil

JAMES McKee, 26-years-old geologist who was lost in the desert (see story on page one), told friends in Tripoli last week that he helped to while away the six days of waiting by learning Kipling's poems by heart.

In addition to the Kipling anthology he carried with him in his truck, McKee had a December issue of the Oil and Gas Trade Journal. This magazine, massive with advertisements and statistics, he read through word by word five times.

McKee explained how he and driver Ahmad had made the journey from ... 4 camp on the ... Every night McKee fired off three Very lights at half-hour intervals. The other oilmen distress signals—the ... of moonlit ...

Constant Reader

Shades of Omar Khayyam, for whom a book of verse and a jug of wine made wilderness a paradise! Here's the case of an oil man who was lost in the Sahara Desert for a week and made wilderness a paradise with a book of verse and The Oil and Gas Journal.

He read that copy of the Journal five times—advertisements, statistics, and everything—word for word. We have thousands of close readers, but this man is the undoubted champion of them all.

Our authority for this is the "Sunday Ghibli," an English-language newspaper published in Tripoli, Libya, a portion of which is reproduced above.

Our constant reader is James McKee, a young geologist from Mandan, N. D., employed by Esso Standard. With an Arab driver he left his seismic camp to take a sick man to the base station 100 miles away and on the return trip they got lost in the trackless desert and ran out of gasoline.

They had enough food and water for a couple of weeks and they knew search parties would find them eventually, so they just holed up in their truck and waited.

While Driver Ahmad wandered around the sand dunes watching for planes and spreading out strips of cloth to attract them, McKee whiled away the long daylight hours with his desert companions—Kipling's poems and our favorite oil publication.

This just proves what we have always contended—that every oil man should have the Big Yellow Book with him at all times. You never can tell what emergency might arise when it will prove indispensable. The Journal has saved many an oil man from bankruptcy, and here's a case where it saved one from boredom.

While it's true that we don't promote it as competing with Kipling for leisure reading, McKee found it a very profitable, and we hope reasonably enjoyable, way to occupy his enforced leisure. Make it a rule never to be caught dead without a copy of the Journal with you.

But McKee wasn't caught dead. At a cost estimated in excess of $30,000, Esso sent out search planes and finally rescued McKee, Ahmad, Kipling, and Journal. The two men were in good condition, but the two books were completely worn out.

The happy ending was attributed to the fact that McKee followed the classic oil man's rules for survival in the wilderness: Stay with your truck, ration your supplies, put out a distress signal, and read The Oil and Gas Journal.

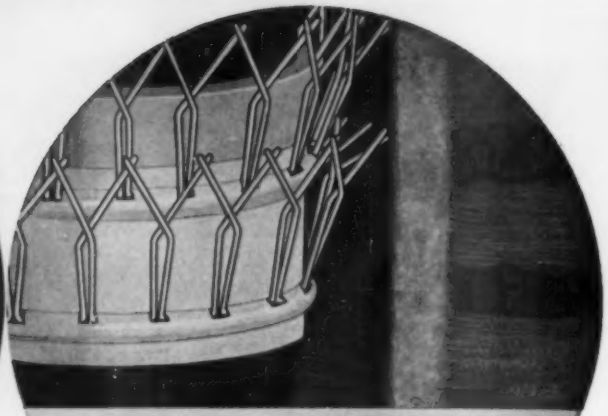
But McKee will have even better reading for his future leisure periods. We are sending him a complimentary copy of "Petroleum Panorama," our big, fat history of 100 years of the oil business.

If you've had a chance to dip into it yet (and how could you resist?) you'll agree that it is as fascinating reading as Kipling for any oil man under any circumstances.

—Henry D. Ralph

BAKER CONTROLLED SCRATCHING

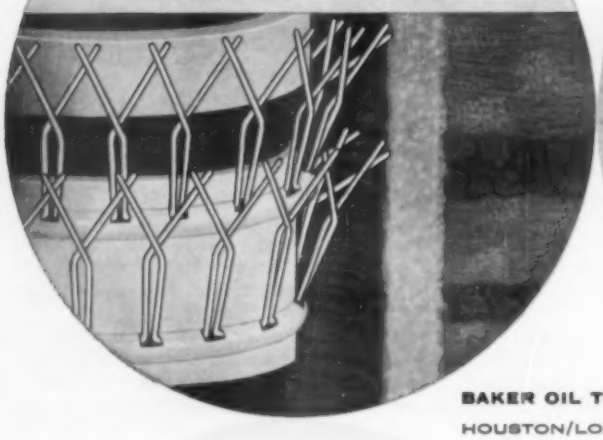
OFFERS MORE THAN EFFECTIVE MUD CAKE REMOVAL



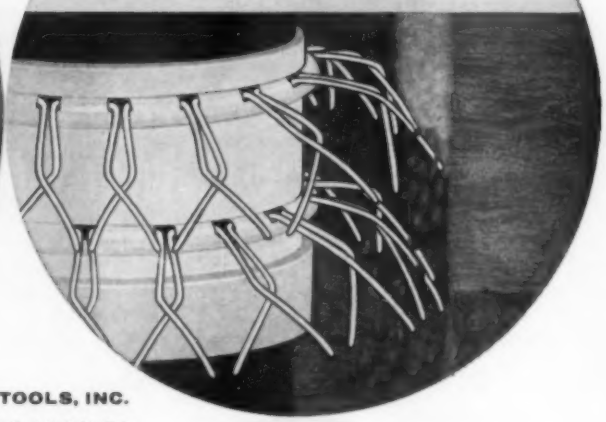
When the casing is being lowered, the scratcher wires swing freely upward and do not remove mud cake which can plug the annulus and cause dangerous pressure surge build-up.

BAKER

After reaching the area to be cemented, the hinged scratcher wires extend to contact the wall of the hole, and when the casing is reciprocated...



...scissors-like operation of the overlapped wires—over the full circumference of the well bore—effectively removes the mud cake which is circulated safely out of the hole.



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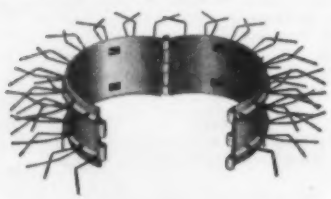

When private rights hamper oil progress

IF the U. S. oil industry is going to make much progress in cutting costs to meet competition, there must be more surrender of private rights to the general welfare.

Two instances are currently in the news in Texas: the Gulf Oil refinery strike for preservation of craft rights, and court battles over the right to drill a well on a tract so small that it will drain adjoining leases.

Both examples are attempts to retain personal vested rights in traditional ways of doing business in the face of modern scientific demonstrations that they are inefficient, cause economic waste, and contribute to high costs.

THE REFINERY STRIKE is to maintain the concept that a man trained in and hired for a specific skill has the exclusive right to perform all operations falling within his craft. Management says it is not attacking the principle but that the practice has been carried to ridiculous and costly extremes.

Without getting into the details of the argument, to an outsider the basic issue appears to be a conflict of individual rights versus group welfare and progress.

The same basic issue is seen in the well-spacing controversy. It is Texas' proud tradition that every landowner has the right to an oil well, even though his lot be too small to contain a drilling rig, and even if his well drains oil belonging to his neighbors.

Another tradition is the ancient "rule of capture," a quaint common-law analogy with wild game which held that oil in the ground has no owner and can be claimed by whoever can get it out first. In all foreign countries and most U. S. states the rule of capture has been thoroughly discredited and either specifically set aside or greatly modified.

Now modern science teaches that oil and gas can be produced more efficiently by widely spaced wells and the operation of a reservoir as a unit. And modern law has shown that, through a unitization agreement, the principle of individual rights in private property can be retained without the economic waste of individual competition.

IN BOTH refinery craft unionism and drilling wells on tiny tracts the stake would seem to be not the principle of individual rights but the limits to which they should be exercised in practice.

Private rights die hard, and this is good. But they have had to give in to modern concepts of restraint, group progress, and general welfare in such areas as traffic laws, zoning restrictions, and many others.

The U. S. oil industry is facing years of tough price competition. To the extent that private rights threaten to price the industry out of the market, their unlimited exercise should be restrained for the good of all.

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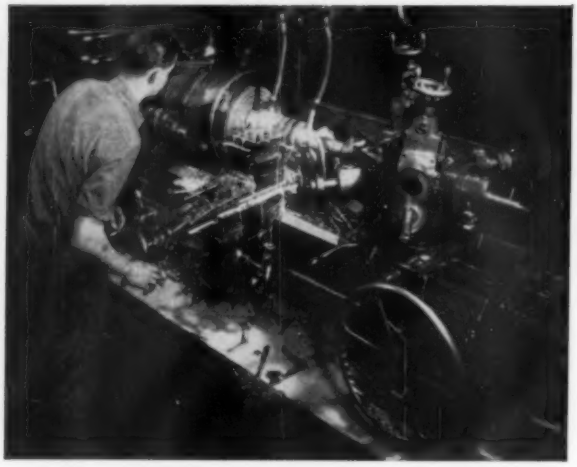

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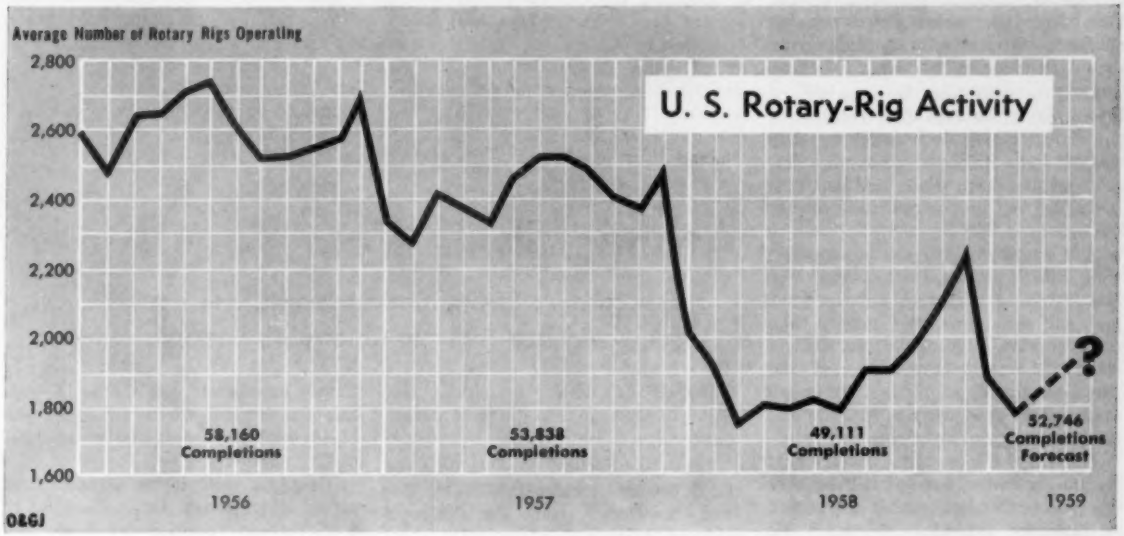


Drilling Starts Pulling Out of Slump

• Although statistics have given a rather bleak picture of U. S. drilling activity so far this year, producers still are shooting high for 1959. Plans still call for boosting completions past 52,000.

A SLIGHT upturn in rig activity indicates U. S. drilling is shaking off the seasonal doldrums and is heading back to work.

The increase last week in the number of active rigs wasn't big—14—but it comes at a time when, in normal years, the industry hits its low point and starts drilling the new year's program in earnest.

Last year activity kept dropping, and the industry wound up 1958 with fewer than 50,000 completions for the first time in 4 years.

This year operators had indicated they would drill 52,746 wells (OGJ, Jan. 26, p. 120). But after eight straight weeks of declining activity, many supply men and contractors began to doubt this year would be any better than last.

A check of operators by the Journal last week shows oil-company plans are unchanged. There has been no curtailment of projected 1959 drilling programs.

Some of the majors, in fact, say their programs are getting under way ahead of schedule. Some of the independents have been holding back, watching for action on imports and keeping an eye on dropping crude prices and rising costs.

Both majors and independents have been hampered in many areas by the weather.

If they stick to their plans, 1959 will show a 7.4% increase in completions over last year's 49,111.

Rig activity . . . The number of rotary rigs in operation moved up to 1,795 from 1,781 the previous week (see table on p. 239).

The significance in that slight increase is that it followed a total drop of 595 rigs over the last 2 months.

The number of active rigs also is 187 less than the number operating at the same time last year. Much of this difference is due to the virtual shutdown in offshore drilling activity.

However, the outlook isn't as bad as a comparison with 1958 would indicate. Instead of turning up in February 1958, drilling activity continued to slump. The average number of rigs was down to 1,800 at the end of March and stayed at that low level through July. It began picking up again in August.

If the industry reaches its drilling goal this year, the number of rigs will have to move up sharply before the end of the first quarter.

During 1957, when 53,838 wells were drilled, the number of active rigs averaged 2,400.

The number of rigs operating this year would not have to reach that high an average to drill the estimated 52,746 wells. Increased efficiency—brought about in part by the 1958 slump—enables drillers to drill more wells and more footage with fewer rigs. There has been a definite upward trend in recent years in the number of completions for the average rotary rig.

While the number of rigs may not go back up to the 2,400-average this year, economists point out it will have to approach that figure to drill the wells forecast.

Outlook . . . The stepped-up drilling programs are in line with the brighter

outlook in general business conditions.

Although there was some pessimism voiced, most producers contacted in the survey are sticking to their prepared drilling budgets and are looking for 1959 to be an improvement over last year.

Paul R. Schultz, president of the Oklahoma Independent Petroleum Association, is one who considers the drilling prediction too high.

Schultz, who also is president of Blackwell Oil & Gas Co., Tulsa, says the industry will be "lucky" to drill 45,000 wells unless a satisfactory import plan on both crude and products is worked out and price structures are strengthened.

A Continental Oil Co. spokesman said, "We are not slowing down. We're drilling more than we ever have and will drill more this quarter than we ever have in history. Last quarter (of 1958) was at a record peak, and this quarter will be higher. We've got approval to continue rigs running and add some more."

He added the company "won't hold back to see what imports will be. We are concerned but not to the extent of dropping behind in drilling." He said he believes drilling will pick up throughout the industry.

Magnolia Petroleum Co. has not trimmed its drilling budget and plans since they were set late last year. Plans call for about 300 wells for the year—about the same as last year.

Atlantic Refining Co.'s program calls for about 15% more wells this year. The company is running a bit ahead of this rate so far this year, but it is still below the 1957 rate.

Sun Oil Co. set projected 1959 drilling in its budget late in November at a rate about 8% higher than the 1958 average. A spokesman says the company is holding steadily to that increased rate so far and has no plans to alter it. He says Sun drilling in January was "way ahead" of the company's pace during January 1958.

An official of British American Oil Producing Co. says drilling is down "some" from last year and that the drilling budget is lower. He adds that dropping crude prices and climbing costs have forced the company to look at each well to see if it is fully justified.

The BA official says the oil-producing business in the U. S. is "fast becoming a losing proposition. When you take as little as a dime a barrel off the top (the price of crude), you're taking away nearly all the profit we've been making in recent years. Then you add higher costs of labor and materials and you have a real squeeze."

Kewanee Oil Co. is increasing its drilling tempo over last year. A spokesman says, "We're ahead of last year right now."

Amerada Petroleum Corp. expects to match the 800 wells drilled last year and is speeding up operations now that the 1959 budget is set up.

Standard Oil Co. of Texas, a subsidiary of California Standard, is attempting to maintain its drilling pace of last year. A spokesman says, "We anticipate being on schedule. We are working hard to drill everything we possibly can that has a reasonable chance of success."

J. U. Teague of Columbia Drilling Co. says, "I haven't heard anyone express any particular fear for 1959. Neither have I heard of anyone being over-exuberant. We anticipate nothing worse than last year and hope it will be a little better."

Earl Hellums of Gracey-Hellums Corp., drilling contractor, says there are too many rigs available and that some drillers are "looking at their hole card."

But he adds: "The boys who make predictions might be right for the year as a whole."

Atomic Shale Test Year Away

. . . according to California scientist. He doubts nuclear blast would free oil from Colorado's vast shale deposits.

DON'T LOOK for an atomic test explosion in Colorado oil shale before the spring of 1960.

That's the earliest possible date for the proposed nuclear blast, Dr. Roland S. Herbst told the National Western Mining Conference at Denver.

The underground shale blast was proposed by Herbst, a scientist at the Lawrence Radiation Laboratory of the University of California at Berkeley, at a recent meeting in Dallas (OGJ, Jan. 12, p. 58). He proposed the experiment as a joint undertaking of government and private industry.

The test, as now being studied by the Atomic Energy Commission and the U.S. Bureau of Mines, would entail the explosion of a 10-kiloton atomic device 1,000 ft. underground in the vast Piceance Creek oil shale deposits in northwestern Colorado's Garfield County (OGJ, Feb. 9, p. 69).

But the go-ahead can't be given, Herbst said, until everyone concerned —government, private industry, and the safety authorities of state and county—agrees that the test should be made.

"First of all, industry must express interest and actually put up money for the preparations," he explained. "The AEC staff then will explore the safety angles with other agencies."

Atomic experts aren't sure the nuclear blast will help in some practical way to put the shale to use, Herbst said.

"And we can't know until we have tried it out on a relatively small scale. We'll have to get the answers by doing in shale what was done in volcanic tuff in Nevada—first with the Rainier test in 1957 and with later, larger tests last October."

Doubt expressed . . . Herbst doubts that the thermal effects of an atomic blast could be used to extract oil from shale underground.

"It might work in the Canadian tar sands, where lower temperatures seem sufficient to produce oil flow," he said.

The scientist believes the crushing action immediately surrounding the blast center probably would powder the shale, making it unusable for retorting.

"So," he said, "the tentative plan would be to set off the blast in poorer shale underneath the rich, Mahogany Ledge shale. The useful breakup—shale chunks suitable for retorting—should occur above the explosion center."

Herbst pointed out that small atomic devices are very expensive and savings "come in the large economy size. For example, a 5,000-ton blast, meaning the equivalent of 5,000 tons of TNT, would cost about $500,000 for the explosive. But a million-ton blast, 200 times as large, would cost only twice as much, or $1 million."

Conventional blasts . . . The AEC this month is conducting a series of three deep explosions in New Mexico salt beds, 30 miles southeast of Carlsbad. These tests are to determine whether an underground blast would damage oil wells and potash mines in the area. The AEC is confident that no damage will result from underground atomic shots. The tests also will determine how well the salt beds retain heat from the explosion for possible use as a source of commercial power.

The three salt bed explosions were planned at 1,200 ft., with 200 lb., 1 ton, and 100 tons of conventional explosives.

THIS VERSATILE credit card will soon be good for Mobil products as . . .

Socony Sells on Hilton Cards

. . . in first big move by an oil company to team up with an all-purpose credit-card firm. Million cards involved.

SOCONY MOBIL Oil Co. and Hilton Credit Corp. last week flanged up the country's first agreement between a national oil marketer and an all-purpose credit-card company.

Under terms of the agreement, more than 32,000 Mobil service stations in 43 states will join other types of retail establishments honoring about 1,000,000 Hilton "Carte Blanche" credit cards.

The big credit deal, which takes in areas where Mobil products are marketed by Socony Mobil affiliates, Magnolia Petroleum Co. and General Petroleum Corp, becomes effective April 1.

The Mobil dealers are the largest single group of retailers of any description to become affiliated with any all-purpose credit card.

While Hilton chalks up an added service for its card affiliates, Socony Mobil will increase by 50% the total number of established credit accounts at its stations.

How it will work . . . The Carte Blanche credit card will buy the same products and services now available to holders of Mobil credit cards.

They will be processed in the same way. The Carte Blanche card will fit the automatic imprinters which Mobil dealers already use for Mobil credit cards. And the dealers will use the regular Mobil sales slips.

Socony contemplates no change in the Mobil card. Dealers simply will be in position to honor both cards equally.

When a Carte Blanche card holder uses his card at a Socony station, the sales slip will go through regular Socony credit channels and then to Hilton Credit for customer billing.

The agreement involves no payment in discount or membership fee by Socony dealers. Socony will pay a minor fee to Hilton Credit to help defray handling costs.

It is estimated that this fee will be roughly proportionate to the cost to Magnolia of its own credit-card operation.

Hilton's Carte Blanche credit card was launched last November with much national publicity. Along with Socony products and services, the holder of this card may use it to charge a wide variety of purchases. The cards are honored by Hilton Hotels, all kinds of specialty stores (cameras, clothing, liquor, furs, restaurants, and even art galleries.).

Injection Planned

by Cities Service in two zones in Dollarhide field.

CITIES SERVICE Production Co. plans to launch gas and water-injection programs this spring aimed at recovering an added 6,450,000 bbl. of oil from its leases in two reservoirs in Dollarhide field, West Texas.

The company is awaiting approval of the Texas Railroad Commission of the program calling for gas injection into the Dollarhide Clearfork and joint gas and water injection into the Dollarhide Devonian.

The Clearfork project would affect 920 acres and the Devonian operation about 1,280 acres of the company's north Dollarhide units "A" and "B."

Both Devonian and Clearfork pools in Dollarhide are solution-gas-drive reservoirs. And the pressure drops and G.O.R. climbs have been sharp since the pools were discovered in 1945 and 1949.

Cities Service has produced roughly 5,000,000 bbl. from the Devonian and 4,000,000 bbl. from the Clearfork to date.

The Clearfork . . . The company seeks initially to inject about 3,000,000 cu. ft. of gas daily into the Clearfork through its No. 4 well in Tract 1.

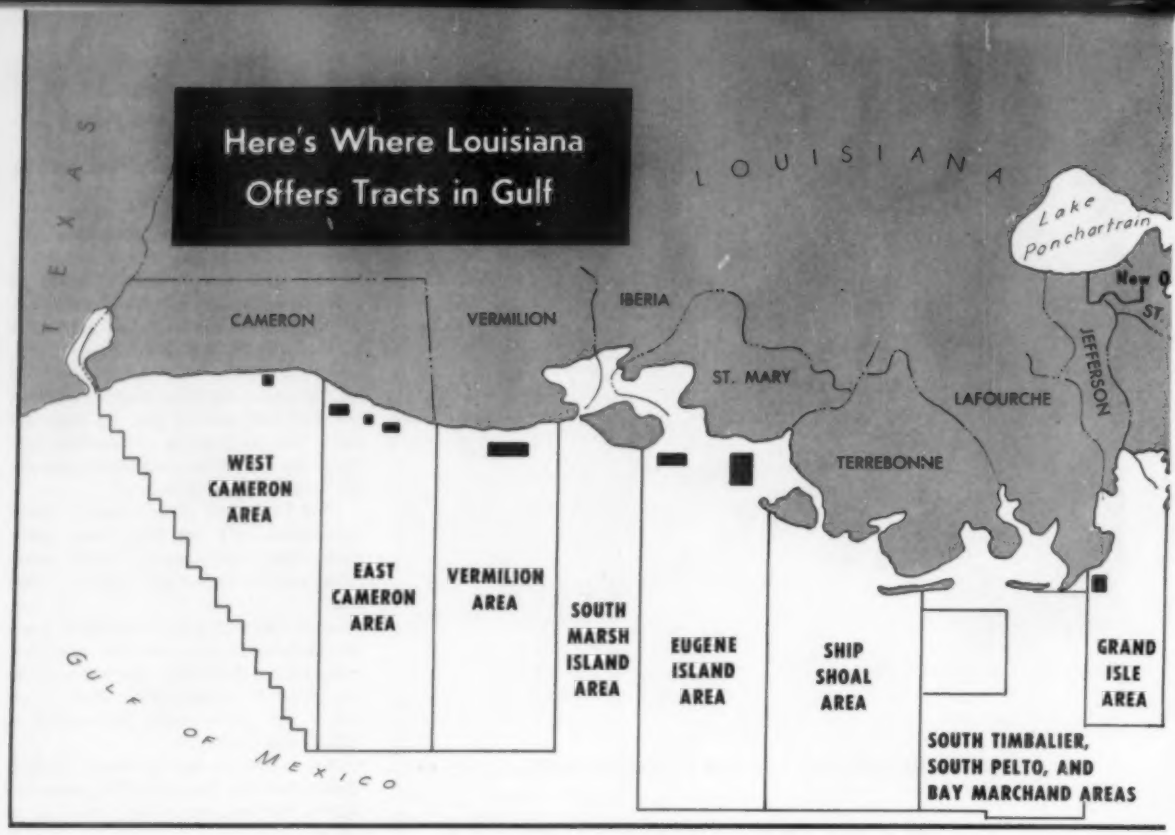
The gas, residue gas from the Dollarhide gasoline plant, would be injected at a wellhead pressure of 1,500 psi. The program would be expanded later to form a five-spot injection pattern with each input taking about 3,000,000 cu. ft. daily.

The Devonian . . . The company plans to launch its pressure-maintenance program in the Devonian with gas injection initially through well No. 1, Tract 1, at a rate of 3,600,000 cu. ft. daily and pressure of 2,000 psi.

It would continue gas input through this well until a cooperative water-injection program could be launched with Pure Oil Co. along the two firms' common lease boundary.

Rules delay sought . . . Pure Oil Co. pointed out to the commission that another Dollarhide hearing is slated for February 19 on Pure's request relative to unitizing the field's pay zones. Pure asked that the commission permit no injection by Cities Service closer than 1,000 ft. to a lease line.

Humble Oil & Refining Co. and Magnolia Petroleum Co. asked that approval of new field rules be held up until after the February 19 hearing.



Lease Sale May Be the Prescription for Lagging

• Size, number of bids may be a key to whether offshore drilling is due a pickup. Many of the Gulf Coast tracts are adjacent to producing fields.

THE OIL industry this week gets its first crack in nearly 3 years at new Louisiana offshore drilling acreage.

Forty-four offshore tracts between the shoreline and the 3-mile line have been nominated for the lease sale Thursday at Baton Rouge.

The sale actually contains more inland acreage than offshore, but the resumption of leasing in the Gulf has kindled extra interest in the bidding. Louisiana halted inland lease sales last summer because bidding interest was low.

The offshore offerings total nearly 100,000 acres, all in Louisiana-controlled Zone 1.

The tracts range in size from 175 acres to a full block of 4,814 acres. The average is about 2,260 acres. Several of the tracts are so close in (six are in Atchafalaya Bay) that some operators don't even consider them offshore.

The Louisiana State Mineral Board, which nominated some of the tracts itself, spread the offshore leasing nearly the full distance along the Gulf Coast—from the West Cameron area to the Main Pass area.

What's in the sale . . . Here's a rundown on the offshore tracts:

. . . **West Cameron area,** two tracts in Block 3, adjacent to the west flank of Creole field. Under earlier lessees, three dry holes were drilled on the tract near production. Sun Oil Co. asked that the tracts be placed in the sale.

. . . **East Cameron area,** six tracts in Blocks 2, 3, 9, 16, 17, and 23. The Mineral Board nominated these six, ranging in size from 250 acres to 4,550 acres. All are near production.

The tracts in Blocks 2 and 3 are close to an extension of Hog Bayou field in Block 1. Tight wells recently have been drilled offsetting the Block 2 tract.

Also there is production just to the east of Block 3 in Block 4. The Block 9 tract has production just to the north within the same block. Shell Oil Co. has developed the Block 16 field and also has production in Block 17. Both are adjacent to the tracts offered.

. . . **Vermilion area,** six tracts in Blocks 6, 7, 8, 13, 27, and 28. The first four blocks were nominated by Union Oil Co. of California. A 1,250-acre tract in Block 27 has adjacent gas production to the northwest in Blocks 14 and 15. Also, Block 26, to the west and southwest, has production.

. . . **Eugene Island area,** eight tracts in the first eight blocks. All were nominated by Union Oil Co. of California, except those in Blocks 3 and 4, nominated by J. R. Murphey.

Tracts in Blocks 1 and 8 are adjacent to State Lease 340, where The Texas Co. is known to have brought in some important recent discoveries.

Two additional tracts in the sale are located immediately north of Blocks 3 and 4 and are designated as part of Iberia and/or St. Mary parishes. J. R. Murphey nominated them.

. . . **St. Mary Parish,** six tracts in Atchafalaya Bay, nominated by Eugene J. Gomes, Jr. Some dry holes have been drilled there.

. . . **Grand Isle area,** one tract, in Block 25, nominated by the Mineral Board. This is an undrilled tract near

Offshore Drilling

the easternmost flank of The California Co.'s active Bay Marchand field.

... **West Delta area,** five tracts, in Blocks 4, 23, 24, and 50. Two tracts in Block 50 were nominated by Gulf Oil Corp. Gulf is now drilling immediately to the east of one tract.

Humble Oil & Refining Co. nominated the tracts in Blocks 23 and 24. Gulf has a rig drilling in a corner just outside the two blocks on a Gulf-Humble lease. Further to the southeast is more Gulf production.

The Block 4 tract, nominated by Union of California, abuts Blocks 23 and 24 on the north.

... **South Pass area,** one tract, Block 27, nominated by the Mineral Board. This 1,130-acre tract is in the southwest quarter of the block and close to Shell's Block 27 field in the north central portion.

... **Main Pass area,** seven tracts in Blocks 54, 55, 65, 66, 83, 84, and 85. All were nominated by E. J. Pitre, except the tract in Block 83, nominated by John F. Bricker.

This is mostly wildcat acreage, although the tract in Block 83 is adjacent to the Block 69 Main Pass field. The Block 69 field extends into Blocks 68 and 67, adjacent to 83. Block 83 has one dry hole.

Import Plan Undecided

... as February 28 end to present program nears. Cabinet spokesman hints committee split over method of control.

NEW VOLUNTARY controls on oil imports are still being considered.

A spokesman for the Cabinet Fuels Committee, which is working on several alternative control measures, indicated last week that the idea of another voluntary program had not been discarded.

It hasn't been proved that a voluntary program won't work, he said pointedly.

The official conceded, however, that a mandatory program is "a possibility, anyway" if the Office of Civil and Defense Mobilization certifies imports to be a threat to the nation's security.

The new study by OCDM, which started early this month, had been interpreted generally as a step toward stringent, legally enforceable quotas on imports.

The sentiment . . . But hints dropped by various government officials last week strongly indicated that:

... **The Cabinet committee** hasn't decided on any single program to be recommended to the President before present voluntary controls expire February 28.

... **Part of the committee,** at least, still leans toward a voluntary plan.

... **If a new voluntary program** is adopted, it will include stiffer provisions to discourage noncompliance.

Industry recommendations to be considered in the OCDM study heavily favor controls on imports of crude and all petroleum products except asphalt and residual fuel.

Strongest defense for residual imports came from William Naden, president of Esso Standard Oil Co. He cited opinion that "residual imports are not excessive and should not be included under any program of either voluntary or mandatory controls."

Three industry spokesmen including D. B. Hodges, vice president of Shell Oil Co., urged exemption of asphalt from general import restrictions. A similar recommendation was made by a manufacturer of asphalt roofing products in New York.

Exemption of low-gravity crude oil with a high asphalt content was among several provisions suggested by Henry O. Weaver, vice president of Western Natural Gas Co. He also recommended special consideration for refineries which have been hard hit by imports and for companies which have developed their own foreign production in the Western Hemisphere.

Products included . . . Most of the other suggestions favored controls on both crude and products if import restrictions are continued.

R. B. Kahle, chairman of Eastern States Petroleum & Chemical Corp., urged that government imports be taken into consideration by OCDM.

Excessive imports "are destroying refined product prices," said M. H. Robineau, president of Frontier Refining Co. He pointed out that inland refiners must compete with foreign oil, both crude and products, coming into the coastal areas.

Robineau urged controls on products as well as crude oil and warned that the independent producer and refiner would both be forced out of business unless the present situation is corrected.

The OCDM timetable gives interested parties until February 22 to submit rebuttal evidence. Then OCDM will have until February 27 to make all data a matter of record. That will leave 1 day for OCDM to determine the need for import controls before the present voluntary program expires.

Trans-Canada Gets More Gas

MORE THAN enough gas is now available to Canadian markets with the additional 1.1 trillion cubic feet approved for Trans-Canada Pipe Lines, Ltd., by the Alberta Oil and Gas Conservation Board.

The action boosts to 5.45 trillion cubic feet the volume of gas which Trans-Canada may take out of Alberta over a 25-year period.

To serve increasing markets this year Trans-Canada will spend $13,500,000 on four compressor stations and 15 sales meter stations. Some $245,000,000 has been spent by Trans-Canada and $113,500,000 by Northern Ontario Pipe Line Crown Corp. for the original system from Alberta to Montreal.

The company also announced that by the end of 1962 it plans to complete 500 miles of looping along its original 2,290-mile line. Compressor horsepower will be increased from 65,500 at the end of this year to 304,500.

Refinery Smog Curbed on West Coast

• Los Angeles refineries are no longer major source of smog after costly control program brings good results.

REFINERS in Los Angeles County have been given a qualified "well done" for their efforts in helping to curb that area's serious air-pollution problem.

A 30-month study shows that the county's 18 refineries are now emitting only about 300 tons of pollutants daily, with about 1,700 tons under control. Some $33 million has been spent for control devices and other remedies.

While recognizing the progress made, Los Angeles air-pollution control officials didn't give the refineries a clean bill of health. They are making further studies to appraise the significance of the remaining pollutants. Also, they want to determine if odors are a nuisance in some cases, and if additional control measures need to be applied.

The extensive studies were a joint effort of the Los Angeles County Air Pollution Control District, California State Department of Public Health, and U. S. Public Health Service. Western Oil and Gas Association also participated.

What's involved . . . The investigation included 16 types of equipment and operations in 18 refineries.

It was estimated that the 18 plants (having a total capacity of 734,000 bbl. daily) had more than 400,000 individual points from which pollutants might escape into the atmosphere.

Sources studied ranged from such large contributors as storage tanks and cat-cracker regenerator stacks to those connected with changing line blinds. Emphasis was placed on hydrocarbon losses, but analyses also were made for oxides of nitrogen, sulfur compounds, and other pollutants.

In the final report to the Los Angeles Board of Supervisors, APCD Chief Smith Griswold commented that the present total losses come from fairly small emissions from many sources.

"That emissions of hydrocarbons have been reduced to a level approximating 100 tons per day is a real tribute to the effectiveness of the air-pollution control program," he said.

"Refinery sources now have been equipped with air-pollution controls approximating the limit of engineering capability. Frequent inspections of refinery operations provide assurance that both basic and control equipment are properly operated and maintained."

Comparisons . . . Griswold also pointed out how Los Angeles refineries no longer are a major source of hydrocarbons and oxides of nitrogen, the two pollutants which react in the atmosphere to form smog.

Of the 1,411 tons of hydrocarbons lost to the atmosphere daily, refineries contribute only 103 tons as compared with 1,000 tons from motor vehicles. Crude-oil producing activities add 60 tons daily, and marketing adds 43 tons more. Other industrial and commercial sources account for the other 205 tons.

As for oxides of nitrogen, refineries contribute only 56 tons daily. This compares with 430 tons from motor vehicles and 215 tons from industrial-commercial sources.

Total emissions from 18 Los Angeles refineries . . .

(Tons per day)

Pollutant—	Cat cracker regen. stacks	Compressor engine exhausts	Boiler and heater stacks	Present total	Estimated total if uncontrolled
Hydrocarbons	20.0	6.5	5.0	103	800
Sulfur dioxide	43.3	...	72.0	115	900
Nitrogen oxides, as NO_2	5.2	4.5	46.0	56	56
Particulate matter	5.4	...	5.0	10	150
Sulfur trioxide	2.7	...	2.0	5	35
Ammonia	4.4	...	Nil	5	5
Aldehydes, as HCHO	1.9	...	0.5	3	5
Organic acids, as acetic acid	...	...	3.5	3	5
Total	...	...	...	300	1,956

. . . and where the hydrocarbon losses occur.

Equipment or operation—	No. of units	Units studied	Hydrocarbon losses (tons per day)*
Cooling towers	93	All	3.0
Valves	132,000	9,600	10.0
Pressure relief valves†	2,250	518	2.0
Storage tanks, crude	135	All	14.9
Storage tanks, gasoline	704	All	27.4
Seals:			
On pumps	2,800	470	6.0
On compressors†	345	325	1.5
Compressor engines	130	...	6.5
Cat cracker regenerator stacks	16	All	20.0
Loading facilities, B/D	90,000	All	0.9
Drains and separators	96	All	3.0
Boilers and heaters	(‡)	20	5.0
Others studied§	...	...	2.6
Total hydrocarbons			102.8

*Losses from cooling towers, boilers, and process heaters measured as hexane. Those from compressor engines were 90% methane, and those from cat-cracker regenerator stacks were mainly ethane and methane.

†Includes only those units which vent to the atmosphere.

‡Represented emissions from burning 4,300 bbl. of fuel oil and 346,000 M.c.f. of gas daily.

§Other emissions studied were those from flanges; blind changing; air-blowing operations; blowdown systems, turnarounds, and equipment maintenance (2 tons daily); waste gas flares; and vacuum jets.

Offshore Test Set

by Gulf off Florida coast. Kerr-McGee to drill well.

GULF OIL Corp. will spud a well off Key West, Fla., this week testing offshore acreage adjacent to an area which The California Co. has asked the Government to lease.

Kerr-McGee Oil Industries' Rig 45 will sink the wildcat for Gulf in 18 ft. of water about 15 miles west of Key West. The well is projected to 15,000 ft.

The drill site is located on one of nine offshore leases originally held by Commonwealth Oil Co. Gulf has a drilling arrangement with Commonwealth. The test is the first for the lease.

Exact location of the well is 24°, 37 minutes, zero seconds north latitude and 82°, 2 minutes, 21 seconds west longitude. The wildcat is designated Gulf Oil Corp. 1, State of Florida Lease 826-Y, Monroe County.

Kerr-McGee's Rig 45 is a submersible drilling barge which was towed to the Florida site from Louisiana waters.

The well holds particular interest at this time because the U. S. Government recently asked for nominations for offshore Florida leases. The California Co. was the only company to respond. It nominated 60 blocks comprising 346,000 acres just to the west of the Commonwealth-Gulf holdings.

The Bureau of Land Management in Washington may postpone sale of the leases because only one company made nominations (OGJ, Feb. 9, Newsletter).

Big Canadian Sale Is Set

ACREAGE near Pan American Petroleum Corp's recent Beaver River gas discovery is expected to bring the highest cash-bonus bids at a Canadian sale March 9.

The offering of development rights includes 3,610,683 acres in the Northwest Territories. Most of the land is in the Trout Lake-Tathlina region in the southwest part of the territories, near the Alberta and British Columbia borders. The offering is the biggest in the history of the territories.

Ten of the 63 parcels are near Pan Am's 1 Beaver River, an apparent gas discovery near the common borders of British Columbia, Yukon, and Northwest Territories. The wildcat blew out and caught fire last month while probing below the middle Devonian (OGJ, Jan. 19, p. 69).

Bids will be received by the federal department of northern affairs and natural resources at Ottawa.

watching WASHINGTON

Joe Reilly

• Leasing crackdown is spreading

INTERIOR DEPARTMENT'S CAMPAIGN against lease-law violators moved into Montana last week, and it's expected to spread to at least four more states before long.

In the latest move, the Government asked cancellation of 34 leases covering about 27,000 acres in Montana. Earlier, it had challenged the validity of leases covering more than 60,000 acres in Wyoming (OGJ, Feb. 2, p. 63). The complaints name 86 individuals and companies in Wyoming and 20 in Montana. Among them are half a dozen major operators.

Officials in district offices of Interior's Bureau of Land Management are combing records in search of more oil and gas leases which apparently were "falsely and fraudulently" acquired from the federal Government.

The drive is aimed at leaseholders who have exceeded the acreage limitations of the Mineral Leasing Act.

Under the present law, an individual or company may hold federal leases on up to 46,080 acres in any one state except Alaska, where the limit is 100,000 acres. However, the Wyoming and Montana complaints are based on a pre-1954 law which set the limit at 15,360 acres.

The cases are directed against individuals and companies who are accused of assisting or conspiring to obtain leases by fraudulent means. But also named are parties who later acquired interests in the leases.

Next step may be taken simultaneously in four other western states where investigations are now under way. Investigators have uncovered many questionable leases. However, the next filing may be held up until hearings are completed in the Wyoming case.

To prevent future violations, Interior Sec. Fred A. Seaton recently adopted new regulations for government lease sales.

They give the Bureau of Land Management authority to require a statement from a lease applicant, showing his complete holdings of federal leases, including any lease in which he may have a partial or indirect interest. A bidder also will be required to furnish details of any oral or written agreement with others who may have an interest in his bid.

• Communists would use U.S. pipe

THE U. S. AGAIN is being urged to relax its ban on shipments of large-diameter pipe to Russia.

An unidentified American company has filed another application for clearance to ship about 13,000 short tons of 28 and 30-in. steel pipe to the Soviets. It is the third such application by the same company. About $2,500,000 worth of pipe is involved.

Earlier applications were turned down by the Commerce Department. The latest rejection was disclosed in January, about the time Soviet Deputy Premier Anastas I. Mikoyan returned home after his visit to this country.

Russia's current 7-year industrialization plan calls for laying a network of oil and gas pipelines. The Soviets are counting on large-diameter pipe from foreign mills to help meet their expansion goals.

There have been reports recently that Russia had placed orders for some 85,000 tons of steel pipe in West Germany. Since Russia apparently could get the desired pipe from our allies if not from the U. S., there has been speculation that the U. S. would reconsider its export ban.

However, the Commerce Department seems to be standing firm on its earlier decisions.

The reported purchases in West Germany are believed to involve 24-in. pipe. Larger-diameter pipe is still on the "positive list" of products which may not be exported from this country to Russia or its satellites without special permit.

Two Triple Pumpers Producing

- **Texas wells make 300-400 bbls. daily through hollow sucker rods and two strings of tubing.**

R. S. ANDERSON, Midland, Tex., independent, has completed a second triple pumper and is preparing to install a third in the Rocker A multi-pay pool in Garza County, West Texas.

Anderson pioneered the industry's first such installation last December (OGJ, December 15, 1958, p. 73).

The two completed triples are Anderson's Skelly-Stoker B-1 and Stanolind-Stoker 6. Joining them soon will be his Stanolind-Stoker 7. The Stanolind-Stoker 6 is ¼ mile southeast of the Skelly-Stoker in Section 939, Block 97, H&TC Survey. The Stanolind-Stoker 7 is a southeast offset to the No. 6.

All three wells will produce oil from the Clearfork, San Andres, and Glorieta pay zones.

The mechanical set-up in all three is identical. The pays produce through 2-in. tubing, 1-in. tubing, and a string of hollow 1-in. sucker rods run inside 5½-in. casing. The three pumps operate on the one string of rods.

Middle and lower zones are separated by a Baker Model D permanent production packer, the upper and middle zones by a Knowlton gas-vent hookwall packer. No new equipment is needed.

The three pays in Rocker A are relatively shallow. The San Andres produces from about 2,500 ft., the Glorieta at about 3,050 ft., and the Clearfork at roughly 3,250 ft.

Production is separated in the well. But the Texas Railroad Commission permits commingling the crude in the same tank battery since gravity, price, and royalty interests are the same. Separate production tests of each zone are required each 3 months. Together the three horizons in the Anderson wells are producing an average 300-400 bbl. daily per well.

No trouble yet . . . Producers to date have shied away from use of pumping equipment to produce three zones in the same well bore due to potential formidable servicing and workover problems.

Anderson told the Journal last week that his triples have functioned perfectly so far and that he doesn't expect a great deal of trouble.

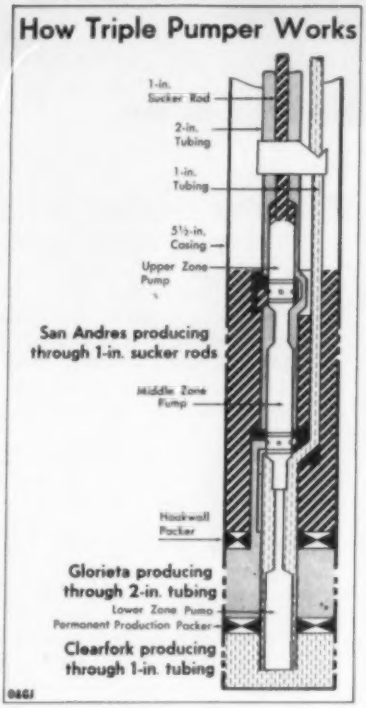
For one thing, he points out, all of the three Rocker A pays are limestone or dolomite formations. Sanding or sand-cutting is no problem. Most pumps in wells in this area will go from 2 to 4 years without requiring servicing, Anderson says.

Furthermore, except for an added pump, equipment in the triples is the same as in duals now producing in the field, he said. One more thing in the operator's favor is that all pumps operate on one string of rods and can be serviced quickly.

This, Anderson said, helps counter the fact that, when pumping equipment for one zone in a well needs servicing, production from all three pays must be suspended.

More coming? . . . Anderson may not stop with three triple pumpers in Rocker A. He intends to "watch the operation for awhile."

If the triples do not require too much servicing Anderson plans to extend use of this technique to other wells in the field—possibly half a dozen more.



Alaska Wildcat Goes Deeper

HUMBLE Oil & Refining Co. has moved well below 14,000 ft. on its wildcat on the Alaska Peninsula.

Originally Humble planned to take the Bear Creek Unit to 12,500 ft. Later the goal was changed to 13,500 ft., but last week it was drilling below 14,099 ft.

Revised goal was not announced. The company is keeping the hole tight, and there is no indication that producing sands have been found.

The well, near Kanatak Bay, is the first of three Humble must drill on a 26,000-acre lease to gain a one-half interest with Shell Oil Co. which holds the lease.

UOP Cash Banked

for research trust fund. Stock nets $68.7 million.

FUNDAMENTAL research in petroleum sponsored by the American Chemical Society can be more than trebled with funds now available from sale of Universal Oil Products Co. stock.

Proceeds from the stock sale netted $68,701,000. They were turned over to Guaranty Trust Co. in New York last week and will be invested by the bank as trustee for the Petroleum Research Fund of the American Chemical Society.

UOP prior to the public sale of stock was owned by the society and operated in trust for the research fund. The company was sold to allow the trust fund's investment portfolio to be diversified.

Returns from investing proceeds of the stock sale plus sale of $4 million worth of debentures should exceed $3 million a year.

This will enable the Petroleum Research Fund greatly to expand the number and scope of its grants for fundamental research in petroleum. Last year the fund granted $979,942 and plans to spend more than $1 million in both 1959 and 1960.

Gross receipts from the sale of the UOP stock were $72,500,000. This was reduced by expenses of $3,799,000, equal to $1.31 per share. The charges consisted of a 75-cent fee for selling, 21 cents for management, and 35 cents for underwriting.

Through 1958 the fund had financed 188 projects in 118 colleges and universities.

Prof. Karl Dittmer, former head of Florida State University's department of chemistry, was named administrator of the fund last month.

Indicted Firms Lose Round

THE 29 OIL companies charged with price-fixing will find out what documents will be submitted in evidence by the Government—but not records to be used as background.

U. S. District Judge Royce H. Savage in Tulsa ruled the Justice De-

partment doesn't have to list the background data prior to the trial. He struck a request for such a list made in a defense-prepared order submitted for his signature.

However, the Government has until February 23 to give each defendant firm a list of all records from any source which it plans to use as evidence.

Sun's Sales Up

as a result of custom-blending at the pump. Biggest demand is for 94-octane.

SUN OIL CO. says its custom blending has been a real boon to gasoline sales.

It finished installing the revolutionary pump that dispenses six grades of gasoline—from a 94-octane regular to a 102-plus octane superpremium—in the U.S. and Canada six months ago. it now finds that:

. . . Since the installations, Sun's gasoline sales have increased at about twice the rate for the industry as a whole.

. . . Sunoco stations are attracting a higher percentage of newer, high compression cars than competitive stations.

. . . Actual purchases by grades have been very close to the advance predictions that induced Sun to expand custom blending.

About 75% of all sales are for Blue Sunoco, the 94-octane grade. The percentage of sales of higher grades decreases as the octane quality goes up.

Sun's experience with custom blending was disclosed by Willard W. Wright, marketing vice president, in a talk before the Missouri Petroleum Association in Kansas City last week. Wright said that an analysis of sales by blends shows that customers are buying quality according to their actual needs.

He described the company's initial experience with custom blending as "extremely encouraging." Dealers have heartily endorsed it, new customers have been attracted to it, and it has passed rigid inspection in 21 states and Canada. The unit's flexibility adds to the potential for the system, he said. Three more grades can be added to the six already being used.

No other major marketer has yet followed Sun's lead. Imperial Oil has given custom blending a trial in Toronto and an independent marketer is using it in several stations in Chicago. The Chicago units are handling the full nine grades.

Tank-Bottom Oil Runs Probed

. . . by Texas attorney general after commission turns up alleged forgeries. Connally Hot Oil Act being studied.

THE TEXAS Railroad Commission has canceled a Texas company's permit to operate a tank-bottom treating plant and has turned its findings to the state attorney general.

The commission's investigation of the case has turned up alleged forgeries on reports to the commission and raised the question whether oil has been run illegally.

The federal Government also has stepped into the case to check possible violation of the Connally Hot Oil Act of 1935.

Whether the case is an isolated one or has widespread implications in Texas was not immediately known last week. The attorney general is expected to follow through and file any charges that the facts warrant.

The company involved is Liberty Oil Reclaim Co., Liberty, Tex. A hearing in January at Houston disclosed that at least seven permits to run tank bottoms apparently were forged and three others had questionable validity, the commission reports.

What testimony shows . . . The 10 permits were designed to authorize Liberty to remove 16,424 bbl. of tank bottoms from leases of John W. Mecom and Tennessee Gas Transmission.

However, officials of these two companies testified the tank bottoms had not been removed from their leases, nor had any such authorization been given.

The testimony raised the question: Where did the oil come from? Liberty's records showed it had receipts of 100,332 bbl. for a 9-month period ending in December 1958, including the 16,424 bbl. in question. The oil was delivered to Sun Pipeline Co., except for 12,104 bbl. lost during treating.

At the hearing in Houston, the Liberty firm was represented by an attorney, but no official or employe of the company testified.

Under Texas law the Railroad Commission is required to supervise removal of tank bottoms, but chief supervisor Harry Batis said at Austin that lack of personnel makes such supervision impossible except in East Texas field.

The Railroad Commission does not charge tank-bottom oil against a producer's allowable.

West Texas Price Cuts Stick

. . . as Gulf move makes the reductions nearly unanimous. Cuts now are beginning to spread into North Texas area.

BUYERS of West Texas and southeastern New Mexico crudes are nearly unanimous now in posting lower price schedules.

Gulf Oil Corp., rated the largest purchaser of the region's crude, last week joined the ranks of other majors in reducing prices.

Gulf's cut, like those of the others, was 7 cents a barrel on the top and 28 cents on the lowest gravities. New tops posted throughout the area now are $3.08 a barrel for sweet, $3.01 for intermediate grades, and $2.95 for sour which also bears a 3-cent differential below 40°.

Gulf normally buys 210,000 bbl. daily from the area, but currently is prorating its purchases because of a strike at its Port Arthur refinery.

Others joining the price-cutting parade during the week were Ohio, Crown Central, Standard of Texas, and Sun. Previously, cuts had been posted by Shell, Cities Service, Cosden, Atlantic, Phillips, Magnolia, The Texas Co., and Humble.

The companies mainly described their price reductions as necessary to meet competitive conditions.

Cuts spread . . . One expected result of the West Texas-New Mexico price reductions was start of price cutting in North Texas fields.

American Petrofina Co. of Texas late in the week posted a 7-cent a barrel reduction in 9 North Texas counties of Archer, Baylor, Clay, Jack, Knox, Montague, Wichita, Wilbarger, and Young, and two west central counties of Stephens and Throckmorton.

The new top of $3.01 per bbl. will affect nearly 7,000 bbl. daily of purchases, American Petrofina officials announced. This covers crude also purchased at leases and moved to the firm's Wichita Falls refinery through pipelines of Continental and Sinclair.

What readers are saying about . . .

PETROLEUM

Your Petroleum Panorama is certainly the most wonderful story of the industry I have ever read. It is historically complete, yet condensed in such a fine manner that the readers hardly realize the time span it covers.

Everyone connected with oil should be most grateful to your publication for handling a difficult self-imposed assignment in such a competent manner.

It is hoped that copies are being made available to lawmakers at the capitol.

C. E. Wright
President
Pennant Drilling Co.

. . . A tremendous job and fully worthy of the important task of commemorating oil's first 100 years.

A. L. Nickerson
President
Socony Mobil Oil Co., Inc.

It certainly revives a lot of personal recollections of my early years in the oil fields. . .

Paul Endacott
President
Phillips Petroleum Co.

We are in constant need of the type of information you have set forth in this journal. . .

Thomas P. Heard, Jr.
Department of Conservation
State of Louisiana

"COLOSSAL" is the word. . .

W. C. Tugaw
President
Adams Corp.

An excellent job . . . I wish that you would send a copy to each of my two sons.

W. M. Vaughey
Vaughey & Vaughey
Jackson, Miss.

Petroleum Panorama far surpasses in excellence any publishing effort I have ever seen. My commendations to all concerned.

E. P. Boyle
Publisher
Oil City, Pa., Derrick

The articles making up "Profile of an Industry" are the best that I have ever read. Please accept my compliments on both format and composition. . .

R. L. Tollett
President
Cosden Petroleum Corp.

This is probably the greatest publishing undertaking that has ever come to my attention . . . I expect to make it a part of our historical file as I know that we will be able to draw upon it for information in years to come.

Emerson Smith
Director of Public Information
Continental Oil Co.

I can't imagine a publisher or editor who wouldn't be terribly proud of turning out anything to compare in any way with your Petroleum Panorama. What a special issue!

George C. Kiernan
President
Eastman Research
Organization, Inc.

It reflects an extraordinary effort and I am sure all the members of the industry will digest its contents with interest and enthusiasm.

Harry A. Jackson
President
American Petrofina, Inc.

. . . A masterpiece of reporting, advertising, and printing. As a former newspaper publisher, now an oil man, I can fully appreciate the tremendous effort of your entire organization in getting out a publication of this type.

I would like to place a copy of this publication in our public library and high schools. Please let me know how I may secure additional copies.

Carl J. Bergman
Lawton, Okla.

Whew! A quick glance was enough to make me write congratulating you on a terrific job.

H. R. Safford, Jr.
Executive Secretary
Petroleum Equipment
Suppliers Association

. . . This volume is a real masterpiece.

William T. Hadley
Foxboro Co.

It leaves me almost speechless, which is something few things can do. . .

Charles Simons
Texas Mid-Continent Oil &
Gas Association

I hope copies are made available to all our high schools, junior colleges, and colleges, where boys who have not determined their life work may be influenced to get into the greatest game in industry. In the language of we who were reared in the "Big Thicket" of Texas, I thought it "Uncommonly Good!"

S. H. Crews
Cactus Petroleum, Inc.

. . . A true and total history of the oil industry, which, up to now, has never been assembled in such a fine manner . . . It is nothing less than stupendous!

Jay P. Walker
President
National Tank Co.

Every page of your Panorama is pleasing. May I add my congratulations to you and your most able staff? The book must be leafed through by the reader and eventually covered page by page before the reader is satisfied. It may well mean that some other reading has to be neglected this month (or this year).

W. L. Horner
Vice President
Core Laboratories, Inc.

Your Petroleum Panorama issue is just another example of why The Oil and Gas Journal continues to be known as the oil man's Bible.

W. K. Warren
Chairman
Warren Petroleum Corp.

It gives a fellow a nostalgic tug to peruse this magnificent piece and then turn to yellowed copies of its great forerunner, the Derrick, with its whimsical oil-country reporting and

PANORAMA

quaint pictures and ads. Indeed, yours is a mighty tome, jam-packed with information, brilliantly researched, edited, and commented upon in a delightfully readable manner.

John M. Abrams
Los Angeles

With due respect to other trade press, it is doubtful if any can equal the superb volume which was published by The Oil and Gas Journal . . . It is a journalistic achievement of magnitude.

Kiley Wilson
Oil Editor
Tulsa World

It certainly brings back memories of earlier days . . . I shall keep it on my desk for easy reference.

Frank H. Dunn
President
Wilcox Oil Co.

Petroleum Panorama has more than lived up to its advance press. It is beautifully executed and will remain as a constant reference in our library.

D. E. Christopher
Gray Tool Co.

This is really a fine reference library item to keep alongside encyclopedias and histories.

J. B. Spangler
Transcontinental Gas Pipe Line Corp.

. . . I do hope that it gets wide readership not only by the many industry people who are bound to feel a certain pride as "foster parents" but by many others outside the industry who could benefit so much by absorbing even fragments of the contents.

Carstens Slack
Manager, Public Relations Division
Phillips Petroleum Co.

. . . It's the kind of book that people will go back to again and again over many years and still find a rewarding tidbit.

Reynolds Girdler
Director, Public Relations and Advertising
Sinclair Oil Corp.

This indeed constitutes a wonderful contribution to the oil and gas industry . . . It is our desire to purchase 10 or 15 copies which may be utilized throughout certain sections and departments of our company.

F. D. Baker
Kewanee Oil Co.
Tulsa

A magnificent job. It is the best job of reporting I have ever seen—and we all would rather be known as good reporters than anything else.

M. W. Jorz
Oil Editor
Los Angeles Examiner

Need an Extra?

While the supply lasts, additional copies of Petroleum Panorama can be obtained for $2.50 each.

The Journal is binding a limited number in hard covers of white leatherette which will be available at $7.50.

Orders should be sent to Reader Service Department, The Oil and Gas Journal, Box 1260, Tulsa 1.

. . . It will join your Golden Anniversary edition as a Bible of industry history. The latter has been consulted and reconsulted hereabouts for years.

Homer T. Fort
Manager, Public Relations
Magnolia Petroleum Co.

. . . I think C. O. Willson was back here searching for pictures the last time I saw him. I know you wish as much as I do that he could see how it all turned out.

James Crayhon
Assistant Manager, Public Relations
Standard Oil Co. (N. J.)

The man hours employed to compile all the information must have been tremendous.

H. G. Kindred
Husky Oil & Refining, Ltd.

This is a crowning tribute to you and your organization, and a truly great service to the entire oil industry.

Rainey Elliott
President
Jones & Laughlin Supply Division

Panorama is a contribution to knowledge and understanding of the history and problems of the industry . . . Its writing is clear, crisp, concise, and its appearance attractive; its illustrations are factual, and its printing a credit to craftsmen. In other words, it's a darned good job.

Claude V. Barrow
Oil Editor
The Daily Oklahoman

It is a record of the petroleum industry's first 100 years that will be referred to time and again in the next 100 years, both within and without the industry. . .

Kerryn King
Vice President
The Texas Co.

. . . It is a real tribute to your long service to the industry and will serve as a textbook to those who are interested in the industry's achievements.

A. C. Rubel,
President
Union Oil Co.

Publication at this time of Petroleum Panorama is especially fitting because of the forthcoming International Petroleum Exposition to be held here in May. . .

E. F. Bullard
Pan American Petroleum Corp.

Having had a part in the oil industry starting back in Pennsylvania "way back when," and having kept up with it through the International Petroleum Exposition in Tulsa since 1928, I appreciate your efforts in presenting the history of the petroleum industry.

William B. Way
General Manager
International Petroleum Exposition

Anti-Import Bills Pushed

. . . by Texas lawmakers at urging of Gov. Daniel's study committee. Furor still rages over tax on gas reserves.

THE TEXAS legislature is taking a hand in the battle to combat excessive crude imports.

The second of three bills recommended by Gov. Price Daniel's import-study committee, was introduced into the Texas House last week. Entitled the "Crude Oil Competition Law," the bill would:

. . . **Prohibit purchasers** or transporters of crude from favoring their own production or that of affiliated companies.

. . . **Bar the sale** or other disposal of crude-oil gathering systems to avoid operation of the Texas conservation laws.

. . . **Define as conspiracy** in restraint of trade any discrimination by a purchaser or transporter of crude in favor of its own produced oil so as to hinder competition, or any sale of gathering system by such firms to avoid operation of the state conservation laws.

The bill, introduced as HB 312 by Reps. Tom James, Dallas, and Truett Latimer, Abilene, follows introduction of another recommended by the imports commission late in January. This one would give the Texas Railroad Commission authority to consider imports by a company or companies also producing in Texas when setting oil allowables.

Tax furor . . . The storm still has not subsided over another legislative issue, however: Governor Daniel's proposed 3% tax on dedicated gas reserves.

Criticism from within and without the legislature is mixed with praise for the controversial tax proposal.

A bill calling for the levy has been introduced in the house and is expected to get early consideration. It is regarded by the Texas oil and gas industry as the most dangerous of several tax bills due for action. It is the only one bearing the governor's endorsement and thus is given a good chance to become law.

The tax would impose a 3% levy on gas reserves dedicated under long-term contract, with the tax falling on the person or corporation to whom gas is first sold (OGJ, Feb. 2, p. 64).

The Texas Mid-Continent Oil and Gas Association has come out with a strong public stand against the tax. Other industry groups in the state are considering such action.

Rep. Frates Seeligson of San Antonio and other legislators criticized Daniel harshly for his proposals to meet Texas financial problems by "merely raising taxes on the same people and occupations that have paid the bill in the past."

Seeligson disputed the governor's estimate too that the gas tax would raise $40,000,000 in revenue over the first 2 years. He said Daniel was about $8,000,000 too high.

Meanwhile, the University of Texas Institute of Public Affairs came out for reform in Texas tax system.

It favors enacting a broad long-range state tax policy—something not contained in Daniel's budget message.

On the other side of the fence, the Texas Farm Bureau strongly endorsed the proposed gas tax.

J. H. West, president, said the tax is fair and equitable "because it does not place an undue burden on Texans" and permits them to benefit from shipments of an "irreplaceable natural resource out of the state."

Other oil bills . . . Other bills now before the legislature which would affect the state petroleum industry include:

. . . **A corporation income tax** on all firms owning property or conducting operations in the state with taxable income of more than $50,000 annually. The tax would be imposed at a rate of 1½% on taxable income between $50,000 and $150,000 annually, and at 2% on income over $150,000.

. . . **A new tax** on the process of severing mineral rights from surface rights. The tax rate would run $10 an acre.

. . . **A mineral-rights bill** which would provide a limitation period of 5 years after which no suit to regain ownership of mineral rights severed from surface rights could be filed.

New Frac Method

claimed by A. G. Bodine, inventor of the sonic pump.

THE INVENTOR of the sonic pump has patented a process for fracturing oil-producing formations by high-power "acoustic waves."

The process involves the use of an electrically operated vibrator which transmits sound waves through a steel rod lowered into the well.

The rod is typically about 80 ft. long. Sound waves transmitted from the elastic rod at the rate of about 100 per second radiate through a "coupling fluid" to the productive formation.

The inventor, A. G. Bodine, Jr., says the invention is based on his discovery that acoustic waves "place the rock media under more cyclic stress than its physical cohesive properties or tensile strength can endure . . . and that under such conditions the rock proceeds to fracture by the process of fatigue failure."

He claims the process has advantages over other fracturing methods for opening new drainage channels in low permeability rock.

The new fracturing technique is said to have been used experimentally

PIPELINE BRIEFS . . .

Resumption of hearings on Transwestern Pipeline's case before the FPC has been reset for March 10. The company is seeking a permit for a 1,800-mile pipeline system to move natural gas from Texas, New Mexico, and Oklahoma fields to California. Cost of the project is estimated at $189,798,000. Hearings recessed December 18 and were scheduled to resume April 13. The hearing date was advanced in response to a motion by Transwestern "indicating the urgency" of speedy action by the FPC.

A 100-mile, 16-in. line is being laid by Arkansas Louisiana Gas from Aetna field in Franklin County, Arkansas, to the company's system at Jones Mills, between Malvern and Hot Springs. Ark-La's own crews are constructing the $6-million line. Completion is scheduled in midsummer. A subsidiary, Arkansas Industrial Pipeline Corp., plans a 130-mile, 18-in. line from Perla to Helena, Ark., to serve a new generating plant of Arkansas Power & Light Co.

A pipeline outlet for Southeast Stockholm and North Buffalo fields in Harper County, Oklahoma, connecting with the Jayhawk Pipe Line in Kansas is planned by Cameron Crude Oil Corp. The 30-mile, 8-in. line would tie in with Jayhawk at its Harper Ranch station. Throughput the first year of operation is estimated at

in a Shell Oil Co. field at Ventura, Calif.

Bodine is president of Soundrive Pump Co., Los Angeles. He is the inventor of a sonic drill and sonic pump (OGJ, July 7, 1958, p. 66).

His patent on the fracturing technique, issued February 3, was applied for in 1954.

Merger Law Sought

by attorney general. Prior notice would be required.

STIFFER ANTITRUST laws, including one to provide advance notice for large corporate mergers, are being sought by Atty. Gen. William P. Rogers.

The antimerger bill is part of a broad program recommended by Rogers in letters to congressional leaders.

It would require advance warning of merger plans involving companies with combined capital assets exceeding $10,000,000. Companies would be allowed to proceed with merger plans in the face of government opposition if they chose to do so.

"I should like to emphasize that the measure does not contemplate the barring of mergers by virtue of executive branch disapproval of merger plans," said Rogers. "It does, however, permit the Government to evaluate the effect of a proposed merger on competition, and to indicate, for consideration by the companies involved, whether the Government will interpose objection in the courts."

Another bill sought by Rogers would give the Justice Department authority to subpoena documents for civil antitrust investigations.

FPC Still Likes Harris Bill

. . . provisions which would cut down on federal controls affecting natural-gas industry, but passage unlikely.

THE FEDERAL Power Commission is sticking by its recommendations for a law to reduce federal controls on independent gas producers.

In its annual report, the FPC reasserted its support of major provisions in the now-stalled Harris bill.

President Eisenhower, who had publicly supported such legislation in the past, has not included it in his recommendations to Congress this year. Without the clear and emphatic support of the President, the bill has been given little chance to pass this session.

Legislative recommendations of the FPC are almost identical to those offered in the past several years. They would:

. . . **Do away with FPC** certificates as a requirement for producers to sell gas for interstate commerce.

. . . **Set a new standard** for evaluating natural gas without relying on a rate base or utility-type controls. This provision would enable the FPC "to weigh the interests of the consumer in low prices with the necessity of providing assurance of future gas supplies . . ."

. . . **Eliminate** any requirement that the FPC determine the cost of producing or the income derived from other hydrocarbons which may be produced with the gas.

. . . **Give independent** producers and pipeline producers the same treatment with respect to pricing or evaluating natural gas.

. . . **Abolish certain** types of escalation and favored-nation clauses in producer contracts.

. . . **Give the FPC** authority to increase interstate pipeline rates where necessary to correct undue discrimination.

. . . **Permit FPC allocation** of gas among customers of an interstate pipeline company during periods of shortage.

. . . **Relax the requirements** for granting temporary certificates, and alter other procedures under the Natural Gas Act.

Recommendations include only those which were agreed on by a majority of the commission, the report pointed out. They do not necessarily reflect individual thinking of the members.

William R. Connole, recently elected vice chairman of the FPC, warned against any legislation which would deprive the commission of its right to consider costs and revenue requirements in natural-gas cases. If the commission were not permitted to consider cost, he contended, the producing industry would be deprived of a constitutional protection against confiscation which all other natural-gas companies enjoy.

Commissioner John B. Hussey, newest member of the commission, did not concur in another recommendation which would permit the FPC to suspend rate schedules on gas to be resold for industrial use only.

5,300 bbl. daily, with buildup to 10,000 bbl. daily as development continues in Harper County. The $1,500,000 project is scheduled to be completed some time this summer.

A 4 or 6-in. extension to the Laverne gasoline plant operated by Sun Oil Co. is being considered. Natural-gas liquids would be batched in the crude line, which extends from southwestern Kansas to the McPherson and Wichita refining areas.

A 15-mile, 30-in. pipeline will be built from the Venezuelan mainland to the Isle of Margarita. This project and a 7-mile, 8-in. line to the Isle of Coche will be laid by Construcciones Collins de Venezuela, C.A., C. A. DeLong de Venezuela, and Constructora Technia of Caracas. The lines will carry fresh water to the islands.

A $2-million pump-station expansion is planned this year by Interprovincial Pipe Line. The Edmonton station will be expanded by 4,450 hp. and a new 6,150-hp. station, the twenty-first on Interprovincial, will be built at Iron River, Mich. Units at both stations will be electric-driven centrifugals, and the new station will be automatically controlled.

The added horsepower will increase capacity to 290,000 bbl. daily out of Edmonton, 365,000 bbl. daily from Cromer, Man., and 300,000 bbl. daily out of Superior.

Also for Pipeliners . . .

IN THE NEWS: Trans-Canada reserves boosted by 1.1 trillion cubic feet (p. 83) . . . FPC still favors less federal control over independent gas producers (p. 91) . . . Pipeline looping is among projects being considered by Iraq Petroleum in $70-million program to boost nation's export capacity (p. 100).

A complete list of pipeline projects is carried in the last issue of each month. Current projects are reported in Pipeline Briefs.

PLUS THESE TECHNICAL REPORTS: Pipeline reduces its capital investment with new design (p. 122) . . . Engine analyzer spots trouble in the making (p. 133) . . . El Paso Natural tries out the new analyzer (p. 135).

U. S. Tankers Show Their Age

. . . and three out of four need replacing in the next 7 years, study shows. They're losing out in world trade.

REPLACEMENT of three out of every four of the 334 vessels in the U.S. tanker fleet should be made within the next 7 years if this country is to keep abreast of world developments.

This is one of several significant conclusions contained in the annual review of the U.S. tanker fleet made by the American Merchant Marine Institute.

More than 70% of the U.S.-flag, privately owned tanker fleet was built during 1941-45. In contrast, 77% of the tanker tonnage operated under foreign flags is of postwar construction.

Not only are foreign flag fleets more modern, but they are in a better position to remain so. Capital requirements abroad are about half those necessary in building for U.S. flag operation.

On January 1, the U.S. tanker fleet's 334 vessels added up to 6,138,485 deadweight tons, according to the institute. This was a net gain of six ships and 356,372 tons. It was the first gain in the number and size of the U.S. fleet in 7 years.

Despite the gain, the U.S. fleet was far smaller than it was a decade ago. On January 1, 1949, it totaled 490 vessels of 7,206,000 deadweight tons.

The greater cost of U.S. construction and operation gradually is driving U.S. flag tankers out of world competition. Almost 80% of U.S. flag tankers are used in coastal and intercoastal service. This service is restricted to U.S. flag ships.

Last year a mere 57,000 deadweight tons of U.S.-flag tanker capacity engaged in foreign-to-foreign service. The total back in 1952 was more than 1,000,000 tons.

The decline of the U.S. role in international tanker trade shows up in the U.S. import record. Only 8% of the imported oil was carried in U.S. flag ships. In the immediate postwar period, 1946-49, U.S. vessels brought in more than 70% of all imports.

Imports last year were the highest on record. Those from Venezuela dropped about 20%, but those from Saudi Arabia, Iraq and Kuwait were up enough to offset the Venezuelan loss. Imports from Saudi Arabia and Iraq more than doubled and those from Kuwait rose more than 40%. Significant imports were received from Borneo for the first time since 1952.

While the net U.S. gain was six tankers, actually there were 14 ships added to the fleet in 1958. Eight were transferred, scrapped or converted. The 14 averaged 31,500 deadweight tons.

The average size of the new U.S. tankers last year was well above the world average of 27,000 tons. World construction in 1958 totaled 215 tankers with an aggregate of 5,856,000 tons, the institute found. On a rule-of-thumb basis, this adds up to an investment of $1,350,000,000.

Aneth Road Project Opposed

UTAH MAY drop plans to connect a road through the Aneth oil field with a highway Colorado is planning into the area.

San Juan County, Utah, interests are opposing an extension of State Highway 262 from its present end near the junction of Montezuma Creek and the San Juan River east to the Colorado border. They favor, instead, a road that eventually would tie in with a projected highway to the south into Arizona. The fear in San Juan County is that a Colorado connection would open the way for oil companies to locate their offices in the southwest corner of Colorado.

Utah Highway Director Elmo R. Morgan said further study will be made before deciding whether to run the Aneth road eastward or southward.

INDUSTRY BRIEFS . . .

First wildcat on California Standard's offshore Refugio lease has been abandoned. The test, about 20 miles west of Santa Barbara, was drilled from a mobile vessel to a total depth of 6,670 ft. California Standard acquired the 3,500-acre lease last year for a bonus bid of $771,000. The company will review results of the operation before planning further action on the lease.

Supplies of fuel oil again are moving normally into New York area after 5,000 crew members and owners of more than 400 tugboats in New York Harbor reached a wage agreement ending a week-long strike. Workers approved a 20-cent an hour across the board wage increase the first year and a 10-cent an hour jump the second year of a new contract.

Charges of gasoline price fixing in the Denver area will be investigated by a Federal grand jury in Denver this week. Earl A. Jinkinson, head of the Justice Department's antitrust division in the Midwest, said the inquiry stems from recent gasoline wars in the Denver area.

Operation Fuel Switch will be continued until May 1 by Los Angeles refineries, power plants, and industrial firms. The plants under the voluntary plan switch from fuel oil to natural gas upon warning that heavy smog conditions are anticipated. The plants each burn more than 50,000 gal. of fuel oil monthly and together comprise 50% of major fuel-oil users in the Los Angeles area.

The OCAW is supporting the oil industry's battle against a proposed 1½-cent increase in federal gasoline tax. Union president O. A. Knight has objected to the tax proposal and is seeking support of the CIO-AFL in presenting opposition before Congress. The union contends the tax poses a threat to jobs of its members by raising gasoline prices to such a level that buyer resistance is encouraged.

A water flood of Lopez field in Webb and Duval counties, Texas, is expected to increase recovery by several million barrels of oil. The flood will be carried out by the newly formed South Lopez unit. Slick Secondary Recovery Corp., which owns most of the leases on the 2,629 acres involved, will operate the unit. Lopez field was opened in 1935 and produces from the first Mirando sand at about 2,300 ft.

A 200,000-acre spread in Central Montana has been put together by American Climax Petroleum Corp. and Lawrence Barker, Jr., a Billings independent. The acreage involves production in Wolf Springs field, Yellowstone County; Melstone field, Musselshell County; and Sumatra field in Rosebud County.

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Gulf Strike Continues

. . . as Shell and Texas Co. sign contracts covering Houston and Port Arthur refineries. Humble still in negotiations.

GULF OIL Corp. tried last week to break a deadlock with striking refinery workers at Port Arthur by presenting figures showing the loss of "many millions of dollars" because of featherbedding at the refinery.

The Oil, Chemical, and Atomic Workers Union struck the plant after Gulf insisted on a clause in the contract giving management the right to prescribe certain duties a man should be allowed to perform incidental to his job.

Gulf cited many cases where skilled workers must be called to do work that the man originally on the job could perform easily.

The union denied the charge and challenged the company to prove heavy financial losses. Figures presented by Gulf at the bargaining sessions last week were not released to the public.

Gulf has offered a 5% wage increase, which is now standard for the industry, but attached a condition that agreement must be reached on contract changes.

Each side in the Gulf-OCAW struggle has lashed the other bitterly.

For example, the union charged Gulf with buying foreign crude at 75 cents per barrel and selling it to its refinery for $3.25 to make the refinery show a million-dollar loss. The company replied that no foreign crude has been put through the Port Arthur plant for many years.

Others settle . . . While Gulf was having its troubles, two other major refineries in South Texas settled their issues.

Shell Oil Corp.'s Houston plant and The Texas Co.'s Port Arthur plant granted 5% wage increases but made no changes of consequence in their contracts with regard to classification of workers.

A Texaco spokesman said work assignment is not a major problem at the Texaco refinery, although there is "a certain amount" of waste time resulting from craft-line requirements. The old contract was renewed for 1 year virtually without change.

Shell likewise said classification and work assignment was not a general issue in its talks.

"It's not the problem with us that it is with Gulf," one Shell official said.

Humble's talks . . . Humble Oil & Refining Co. still was negotiating last week with its Baytown, Tex., refinery workers, represented by the independent Baytown Employers Federation.

The Humble management wants more latitude in the assignment of work at the plant but is not advocating the broad "refinery mechanic" classification.

The company has told the union it wants to maintain craft lines where skilled work is involved. Latitude is needed in the performance of incidental tasks related to specific jobs where the employe is qualified to do the work.

Wages are not an issue at Baytown, at least not for now. Humble has made the 5% offer, although the union has not yet accepted it.

The Humble refinery at Baytown has had collective bargaining since the first units were built nearly 40 years ago. The BEF has represented the workers for nearly 25 years. There has never been a strike.

Oil Scheme Target

of proposed law to limit federal lease subdividing.

THE SPECULATOR'S dream of "striking it rich" on a 40-acre government lease may fade away with this session of Congress.

Interior Sec. Fred A. Seaton is renewing his campaign for a law to prevent the subdividing of federal oil and gas leases covering less than 640 acres.

Seaton's proposal was followed by introduction of a bill by Sen. Joseph C. O'Mahoney (D-Wyo.). The bill would permit subdividing of federal leases into small tracts only if certain drilling, unitization, or other requirements are met.

Safeguards to protect unwary investors from misleading advertisements by leaseowners and brokers have been proposed by the Interior Department in letters recently sent to congressional leaders. Similar legislation was urged late in the last session after Seaton had warned against advertising which solicited investments in oil and gas leases on federal lands.

Existing leases which cover less than 640 acres would be exempted from the proposed acreage limitation.

Interior reports that small-tract advertisements have caused an unprecedented influx of offers for 40-acre leases and have imposed a heavy burden on the various land offices.

In 1952, Seaton pointed out, steps were taken to restrict the issuance of federal oil and gas leases covering less than 640 acres. But leaseholders are still allowed to subdivide their blocks into 40-acre tracts.

The "customary" price for a 40-acre lease advertised in newspapers is $100, Interior pointed out in the report to congressional leaders.

"The average layman . . . can be easily misled by advertisements which report oil strikes," it added.

Rate Hike Granted

Phillips by FPC following court of appeals ruling.

PHILLIPS PETROLEUM Co. has won a slight price increase to "correct" a natural-gas rate which had been frozen since independent producers were brought under federal control in 1954.

The rate increase, allowed by the Federal Power Commission in compliance with a court mandate, amounts to a scant 0.28127 cent per M.c.f. It brings total price for gas involved to 3.46363 cents per M.c.f.

Involved in the long-contested case

PROCESSING

Monsanto is boosting capacity of its high-pressure polyethylene facilities at Texas City to 100,000,000 lb. annually. Construction will be completed late this year. The expansion is an outgrowth of several technical advances which permit automated productivity and better control of a wider range of properties of the ethylene resin.

A new natural-gasoline plant is on stream 15 miles southeast of New Orleans. Built by Texas Natural Gasoline and Tennessee Gas Transmission, it will process 150,000 M.c.f. daily. Texas Natural will operate the plant, which was constructed by Fluor Corp.

Construction has started on a $650,000 addition to the lube plant and improvement of the wax facilities at the Sohio refinery at Lima, Ohio. Completion target date is May 1. It is part of an expansion program which includes continuous molding equipment already installed at the Sohio No. 2 refinery in Cleveland.

is gas sold to Panhandle Eastern Pipe Line Co. in Moore County, Texas.

On June 7, 1954, when the Supreme Court handed down its Phillips decision placing independent producers under federal regulation, Phillips had been billing Panhandle for the gas at 3.18236 cents per M.c.f. In June 1956 Phillips submitted a revised billing to "correct" the rate to 3.69863 cents.

Panhandle protested the rate increase. After public hearings, an FPC examiner set the rate at 3.46363 cents under "royalty adjustment" provided in the sales contract.

The FPC later reversed the examiner's decision, but Phillips was upheld by U. S. Circuit Court of Appeals.

In approving the higher rate, the FPC denied a motion by Phillips to reopen the case. It also rejected a later rate increase to 3.9102 cents which Phillips had been collecting subject to refund since August 1957.

In a separate case, an FPC examiner last week rejected a rate increase sought by Panhandle Eastern. In seeking higher rates for itself, the pipeline company had sought to use the "field price approach" in determining the value of its own gas production.

The increase, amounting to about $7,247,000 per year, is subject to refund if the examiner's order is upheld by the commission.

Processes Keep Well Bore Dry

. . . for air or gas-drilling operations. Gulf says a gas forms sealant to plug a water-producing sand formation.

TWO WATER-SHUTOFF processes for rotary drilling with air or gas have been developed by Gulf Oil Corp.

Gulf says the new techniques have been 99% to 100% effective during field tests in sealing off water from the well bore in sand-type formations.

The company predicts use of the two methods will increase the number of wells drilled with rotary tools while circulating air or gas, which means faster penetration rates and longer bit life than drilling with mud or water.

The processes . . . In the first method Gulf injects under pressure a chemical liquid, followed by injection of a gas into the porous, water-producing sand.

The gas and chemical solution react in the rock pores to create a solid, water-insoluble precipitate which plugs the openings between sand grains for about a foot around the well bore.

In the latest development—termed more simple and more effective than the first—Gulf injects a "special" gas. The gas fingers its way through the water, mixing and reacting as it goes. This forms a precipitate in the sand pores, sealing off the unwanted water flow. Gulf researchers say when pressure is relaxed and the water presses back against the seal, it packs the precipitate tighter, furthering the plugging action.

Before either process is used, Gulf usually isolates a well's water-producing zone with packers above and sometimes below the sand. The plugging materials then are pumped under pressure through the drill pipe into the water-producing formation.

Without naming the plugging materials, Gulf said that commercially available gas and very simple equipment are used with the latest process, and that both developments are being licensed to well-servicing companies.

Limitations . . . Gulf says the processes have not proved as applicable to fractured formations and certain limestone formations as they have to sand.

Also, the methods can't be used economically where too many water zones are encountered in one well.

BRIEFS . . .

A new world's record for continuous operation of a fluid-coking unit is being claimed by Tidewater's Avon refinery near San Francisco. The 42,000-bbl. daily unit has passed the record of 300 days set by another Tidewater unit at its Delaware refinery.

A portable natural-gasoline plant will be built by Continental Oil on the company's Ramsey lease near Pecos, Tex. The units will be assembled on location and mounted on skids, enabling Conoco to move the $430,000 plant from one location to another in a few weeks' time. Initial capacity will be 5,000 M.c.f. daily. Completion is scheduled April 1. Southwest Industries, Inc., Houston, has the contract.

A $325,000 plant to make liquid asphalts for road construction and maintenance will be built at Imperial Oil's refinery in Winnipeg. The 125,000-bbl. a year unit will be completed by June 1.

Continental Oil's grease plant in Ponca City, Okla., will be expanded and modernized at a cost of $380,000. Work will start soon, with completion scheduled late this year or early 1960. New automatic equipment will control temperature, flow, mixing, and other steps. Continental currently is modernizing its compounding and packaging plant at Ponca City. The two jobs will cost more than $1 million.

Construction is under way at Reichold Chemicals' $5-million phthalic-anhydride plant near Elizabeth, N. J. Capacity when completed late this year will be 30,000,000 lb. annually. Badger Manufacturing is building the plant.

A $2-million Air Force contract for production of high-energy boron fuels has been awarded to Stauffer-Aerojet Chemical Co. Liquid fuels will be produced at a large pilot plant now under construction near Sacramento, Calif. Stauffer-Aerojet was formed a year ago by Stauffer Chemical Co., a leading producer of boron chemicals, and Aerojet-General Corp., designer and manufacturer of missile and rocket-propulsion units.

Also for Refiners . . .

IN THE NEWS: Atomic test explosion in Colorado oil shale is not expected before 1960 if then, scientist reports (p. 80) . . . Socony makes deal to use Hilton's all-purpose credit cards (p. 81) . . . Cabinet fuels committee is still undecided on plan for imports—voluntary approach still alive (p. 83) . . . West Coast refiners are making big gains in smog control (p. 84) . . . UOP stock sale nets $68.7 million for petroleum research fund (p. 86) . . . Pump blending has boosted Sun's gasoline sales (p. 87) . . . West Texas-New Mexico price cuts are almost unanimous. Cuts are now spreading to North Texas (p. 87).

PLUS THESE TECHNICAL REPORTS: A special section on gasoline processing and problems (pp. 105-120) . . . Atlas installs first C_6 Penex unit (p. 146).

FOUR CONTINENTS
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Lost Circulation Attacked

. . . by new method developed by Atlantic. Researchers say technique takes Sunray's process a step further.

OIL-COMPANY research soon may make one of drilling's most dreaded villains, lost circulation, a much less troublesome problem.

Several companies have contributed advances in recent years to methods for fighting lost circulation.

Sunray Mid-Continent Oil Co., for instance, found in 1957 that it could stop mud loss faster and more effectively by using a high-water-loss mud and allowing it to soak. The mud used is a high-water-loss (30-50 cc.) attapulgite slurry.

The Sunray premise is that this slurry will fill the offending fracture faster, and the fluid will dehydrate more rapidly, leaving solids to seal off the fracture (OGJ, Oct. 28, 1957, p. 96).

Now Atlantic Refining Co. is well along in developing a new method which it hopes will not only control lost circulation but also help prevent it.

How it works . . . Atlantic has followed the Sunray line of reasoning and taken it a step further.

Atlantic mud technicians think that the filter cake laid down on fracture walls by regular drilling mud when lost circulation occurs controls the rate of filtration in the fracture during attempts to seal it off.

Thus, a material should be injected ahead of the high-water-loss slurry to degrade the filter cake.

Regular hydrochloric acid, they feel, fills the bill as a degrading agent for lime or gyp-base muds.

Atlantic injects first the acid, then the high-water-loss slurry into the zone of lost circulation. It does not soak but continues to inject slurry slowly. Within a few hours, Atlantic says, the continued injection creates a squeeze pressure and fills the fracture with filter cake.

The squeeze does two desirable things. Atlantic researchers say it:

. . . **Conditions fracture** against later breakdown because of pressure surges or later increases in mud weight. The conditioning results from the high pressure under which fracture is sealed.

. . . **Fractures other weak formations,** which might lose circulation later in the drilling operation, and fills and seals these off similarly.

Field tests of the process, Atlantic says, are encouraging. Most of the tests have been carried out in South Louisiana where lost circulation is most frequent and troublesome.

Both Atlantic and Sunray methods are based on the concept that, in the soft Gulf Coast type of drilling, lost circulation usually occurs when a porous formation is fractured.

It is usually restored by soaking (leaving hole full of mud without trying to circulate) and putting lost-circulation materials into the mud. Eventually the fracture is filled with mud filter cake.

Presence of the lost-circulation material may be helpful, Atlantic thinks, because it strengthens the mud cake.

Wilmington Flood Expanding

THE GIANT water-flood program in California's Wilmington field is one-fifth of the way to ultimate injection rate of 1,000,000 bbl. daily.

Operators are injecting 201,015 bbl. of water daily in 35 input wells. The flood is primarily designed to curb subsidence. Field-wide unitization is the ultimate goal at Wilmington.

Sam Roberts, subsidence administrator at Long Beach, said he hopes to have final unitization plans for two critical areas ready by March 1.

The critical areas are Fault Blocks 1 and 3. This is where the greatest subsidence has taken place. The Long Beach Naval Shipyard is in this area. Last summer the federal Government filed a suit, demanding that operators halt subsidence or shut down the field (OGJ, Aug. 25, 1958, p. 52).

Favorable results were indicated by pilot-flooding operations in a square-mile area of the field by the Long Beach Harbor Department. Long Beach officials said the pilot flood not only checked subsidence in that area, but the land surface actually rose 0.6 in. at several points (OGJ, Jan. 26, p. 112). The study was made of flooding in the Tar, Ranger, and Terminal zones of Fault Blocks 2, 3, 5, and 6.

the JOURNAL *said . . .*

50 *years ago*

February 20, 1909

Ninety-five per cent of oil producers replying to a questionnaire by the Mid-Continent Oil and Gas Producers Association favor a shutdown of drilling of from 4 to 6 months to curtail production and help solve the problem of oversupply.

A 300-bbl. well producing oil the color of vaseline from 2,100 ft. is brought in near Boulder, Colo., by Inland Oil Co.

Two Boulder refineries with capacities of 100 and 500 bbl. have announced they plan to double capacities.

Four independent producers, Frank Phillips, George C. Priestly, and W. H. Johnson of Bartlesville, and George W. Barnes of Muskogee, have gone to Jefferson City, Mo., to urge that Standard Oil Co., facing an ouster suit, be permitted to remain in the state. A shutdown would seriously affect the Oklahoma industry, they contend.

25 *years ago*

February 15, 1934.

Production of crude oil in Russia in 1933 averaged 411,170 bbl. daily, compared to 408,000 bbl. the year before.

A suit in Amarillo federal court by the Panhandle Conservation Association, naming several companies, tests constitutionality of the "sour gas" law permitting gas to be taken from Panhandle fields for processing without requiring the residue be used. E. C. Bratain, association director, charges 2,500 trillion feet of gas, enough "to supply Texas for 70 years," is being wasted.

New York Stock Exchange asks presidents of 45 companies for information on accounting practices. It seeks adoption of standard methods for reports on earnings. The exchange says the API program of standaridzation has not reached the point where it is reflected substantially in company annual statements.

10 *years ago*

February 17, 1949

Land and marketing facilities in eight cities of Japan, seized in 1941 by Japanese Government, are restored to Standard-Vacuum.

Check of existing capacities in steel plants is asked by Wherry small-business committee. It charges scarcity of fuel oil resulted from conspiracy to withhold supplies, with regulatory bodies of oil-producing states the chief conspirators.

Stanolind suspends all exploration activities in Colombia, pending a more favorable industry situation there.

Bureau of Mines Director James Boyd tells O'Mahoney committee oil imports must increase to keep industrial activity at high level.

A total of $50,000,000 will be spent in Canada in 1949 for exploration H. H. Hewetson, Imperial Oil president, tells AIME.

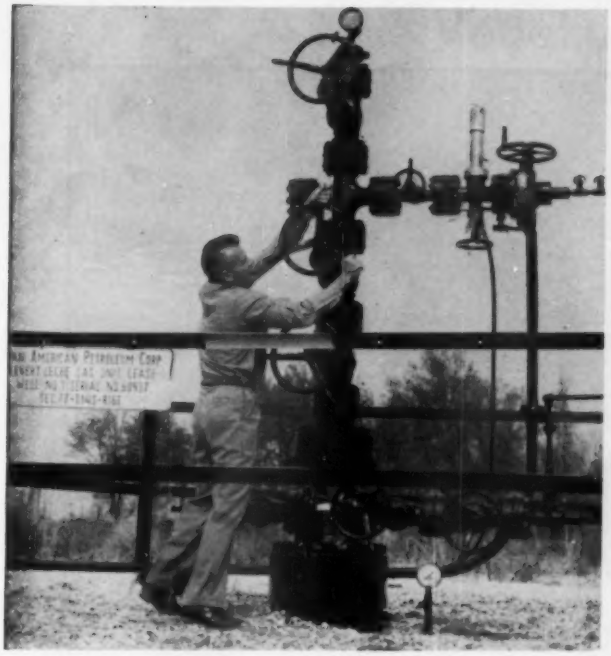
PHOTOS IN THE NEWS

Oil in your ears

The Turner 3-BB Shannon went wild in true Texas gusher style last week with the results pictured here. The cable tool rig and other well-site equipment was wrecked (above) and sprayed with oil. Rig operator Orville Myers of Odessa (right) got an earful of oil in the process.

A 7-in. column of oil shot more than 100 ft. into the air, and in 24 hours the well spewed an estimated 75,000-100,000 bbl. of oil before it was controlled with mud. The crude flowed into a nearby ravine which quickly was dammed to create a lake of oil.

The well is the third in a new pool opened by Fred Turner, Jr. of Midland near the town of Iraan in western Crockett County. The first two were 80-bbl. daily pumpers. The blowout well, rated a geological freak, may prove to be in a completely new reservoir at 1,853 ft.



NEW FIELD TAPPED for Pan American Petroleum by superintendent T. H. Sandoz. He turns the valve that sent gas from North Thibodaux field, Louisiana, flowing into the vast new gas-gathering system of Transcontinental Gas Pipe Line Corp.

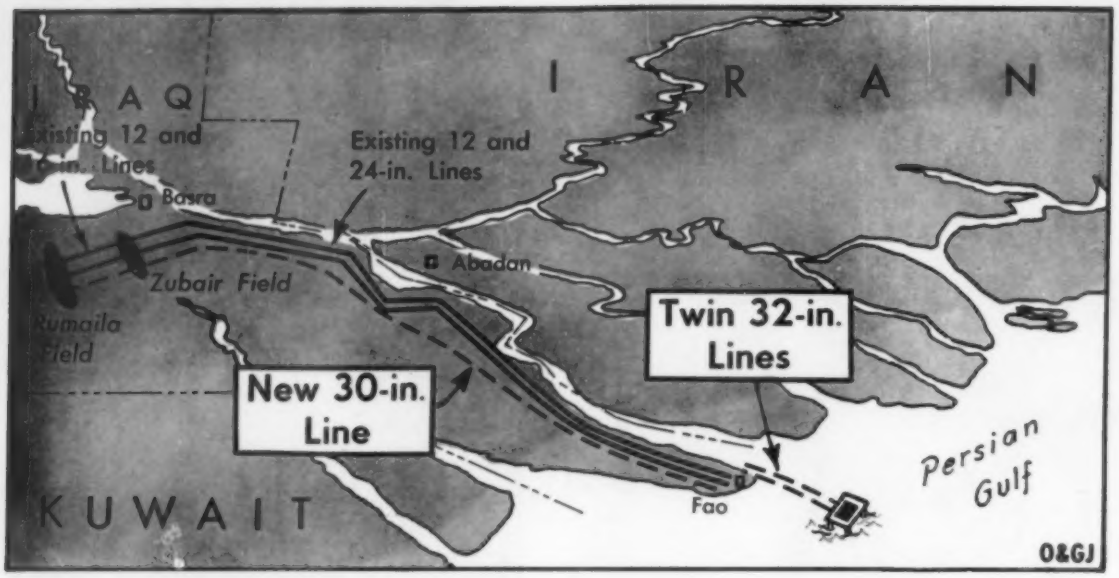
READY TO BITE is this 46-in. Grant drill and reamer shown poised above the floor of Terminal Drilling Co. rig which drilled two ventilation-escape shafts at a uranium mine owned by Phillips Petroleum Co. in Ambrosia Lake area near Grants, N. M.

Quick Alaskan Start

Halbouty Alaska Oil Co. has spudded an important test in Alaska's Kenai peninsula just 20 days after its winterized rig was loaded at Long Beach for the trip to Alaska.

The wildcat, located 3½ miles southwest of Richfield's big Kenai strike, is a venture of Halbouty and King Oil Co. on a farmout from Alaska Oil & Mineral Co.

The Coastal Drilling Co. rig is winterized for 10-below-zero weather. Steam boiler furnishes heat for derrick floor and steel mud pits. At time of spudding, steam pipes also were run inside the conductor pipe to prevent the cement from freezing before it set.



IPC Has Big Plans for Southern Iraq

• Huge $70-million program will boost export capacity 200,000 bbl. daily, provide deepwater pier near Fao for 65,000-ton tankers and pipeline loops from Rumaila, Zubair field. Kirkuk flood studied.

THE WRAPS have come off a development program that will eliminate Iraq's Achilles' heel—the lack of a major oil port on the Persian Gulf.

The program will make Iraq's oil industry safer from crippling disaster if its pipelines to the Mediterranean are ever again sabotaged as they were 3 years ago.

It will give crude from the country's southern fields a better chance to compete with oil from Kuwait, Saudi Arabia, and Iran. It will meet the demands of the young revolutionary government for steps to increase production.

Basrah Petroleum Co., the local affiliate of Iraq Petroleum, will spend $70 million to increase the export capacity of Rumaila and Zubair fields from the present 240,000 bbl. daily to 440,000 bbl. daily. Here is what it plans:

. . . **A deep water terminal** will be built 24 miles out to sea at the mouth of Shatt-al-Arab River.

. . . **A 30/32-in. crude pipeline** will be added to the existing system from Rumaila and Zubair.

. . . **A 2-rig drilling** program will be carried on in the fields for 2 years.

Terminal on piles . . . Contracts for terminal construction have been awarded to a three-company group, Raymond International (U.K.), Ltd., De Long, Ltd., of London, and Richard Costain, Ltd., of London.

They will build a 1,302-ft. pier 24 miles off shore from Fao, the present loading port. The pier will consist of five platforms, with the largest 400 ft. long by 240 ft. wide. in the center. At each end of the central platform, catwalks will extend to mooring dolphins, one for breastlines and another larger one for head and stern lines.

One of the larger end sections will have living quarters for shift crews. The other end will have a heliport. All five platforms will be supported on steel piles.

Crude for the terminal will be fed through two 32-in. submarine lines from a pumphouse at Fao. Contractor for the submarine lines is Collins Submarine Pipelines Overseas, Ltd.

The terminal will accommodate two 65,000-ton tankers at the same time, with a combined loading rate of 8,000 tons per hour. Until 2 years ago, the shallow Shatt-al-Arab River limited Fao loadings to T-2 class tankers. Dredging since then has helped. But big, new supertankers still can't make it to the old terminal.

On shore development . . . A new 30/32-in. pipeline will be laid from Zubair to Fao, with feeder lines from Rumaila to Zubair. The existing system to Fao from Zubair consists of a 70-mile, 12-in. line and a 65-mile, 24-in. line. An 18-mile, 16-in. line and a 12-in. line run from Rumaila to Zubair.

The field development program will be carried out by Kier & Cawder Arrow Drilling (U.K.), which will drill 11,000 ft. wells under a 2-year contract.

Rumaila produces 34.7° gravity crude from Cretaceous sandstone at 10,800 ft. The 6-year-old field last year was producing 152,000 bbl. daily from 14 flowing wells. Six more wells were shut in. Ten-year-old Zubair field has 35.9° gravity oil produced from Cretaceous sandstone at 11,000 ft. It was averaging 73,000 bbl. daily last year from 21 wells. Another 17 wells were shut in.

Kirkuk water flood . . . IPC also is

pushing programs elsewhere in the country. It has awarded a drilling contract to Drilling & Exploration, Ltd., of London, for work in Kirkuk field.

Drilling & Exploration has moved in two 8,500-ft. rigs for water flood and development wells in the giant field. The water flood may someday be the world's largest, with an injection of over 500,000 bbl. daily in the early stages. There may eventually be 25 or more injection wells.

IPC will be able to move more than 700,000 bbl. daily through its Mediterranean pipeline system by the end of the year from Kirkuk and smaller fields in northern Iraq.

A looping program is under way on the 30/32-in. pipeline to Banias, Syria. About 125 miles of 24, 30, and 32-in. loops between T-2 pumping station and the Mediterranean has been put into operation.

Fire Floods Revive

shut-in Japanese wells; 450 more to get shot in arm.

AN INSITU combustion program is planned for Japan's tired-out oil fields.

This method of secondary recovery, relatively untried here, has been selected because of encouraging results of an experiment in 63-year-old Niitsu field. Teikoku Oil hopes to recover more than 70-million barrels from shut-in or marginal fields such as Hachimori and Chokai.

Two 800-ft. combustion wells were drilled in the northeastern corner of Niitsu field for the experiment. These were surrounded by six pumping wells. The first well was ignited by an electric spark January 25.

The company expects to recover more than 42,000 bbl. from the six wells in 6 to 10 months. This would average from 23 to 39 bbl. daily per well. Present output from more than 450 wells is less than 1 bbl. daily each.

Seismic Tests in North Sea

EUROPE'S first offshore exploration program will get under way soon in Netherlands waters.

Netherlands Oil Co., jointly owned by Royal Dutch-Shell and Jersey Standard, will conduct a seismic survey in the North Sea off Southern Holland.

On-shore fields in the area, in the vicinity of Rotterdam, now produce about one-fourth of the country's 30,000 bbl. daily. A drilling barge for the venture is under construction in Rotterdam.

Venezuelan Regime Watched

. . . for changed attitude to oil. Speculation centers on possible appointment of Perez Alfonso to key cabinet job.

ROMULO BETANCOURT took office as president of Venezuela last week. But to oil men the event was an anticlimax.

Their big question now: Who'll be named minister of mines and hydrocarbons?

Betancourt has not announced his selection. Indications, however, in Caracas are that an old Betancourt colleague, Dr. Juan Pablo Perez Alfonso, will get the nod.

If this proves correct as expected, oil executives privately fear the new administration will make a quick start toward Betancourt's avowed goal of gaining a greater participation for the Government in Venezuela's oil industry.

The man . . . Dr. Perez Alfonso was a former minister of development in the Betancourt regime of more than a decade ago.

He went into exile at the same time that Betancourt was expelled from Venezuela by the military junta headed by ex-president Marcos Perez Jimenez.

Dr. Perez Alfonso is a lawyer by profession and is a keen student of politics and economics with special emphasis on petroleum policy. During his years of exile, he lived in Washington, Canada, and Mexico and made frequent trips to Europe. And in those years he continued a close study of oil operations.

Many oil men believe Dr. Perez Alfonso's views on future oil policy in Venezuela closely parallel those of Betancourt.

One hint of this is past experience. Dr. Perez Alfonso, as minister of development, was a leader in writing and passing the nation's present petroleum law. Many oil men still remember that he strongly favored a greater share to the government than the 50-50 participation the law now provides.

The program . . . If he still holds these views, the important cabinet post would give Dr. Perez Alfonso an excellent chance to put them into effect through a revised petroleum law.

He would almost be assured of Betancourt's backing, because the new president in his campaign called for:

. . . An active role for the government in all oil-industry programs.

. . . A national petroleum company controlled by the state.

. . . A new company, controlled by the government, for overseas transportation of oil.

. . . A national refining and petrochemical industry.

. . . A halt to granting concessions to foreign companies.

Betancourt maintained, however, he does not favor complete nationalization of the oil industry. He aims only to be certain the nation increases its participation in benefits of this natural resource.

The close Betancourt-Perez Alfonso relationship makes the Venezuelan oil companies somewhat uneasy about possible government moves. They view the future with uncertainty.

Some hold one hope: The years in exile may have influenced Dr. Perez Alfonso to a more moderate position.

Shell Buys Italian Plant

ONE OF ITALY'S most modern refineries has been purchased by Royal Dutch-Shell.

The plant is the 45,000 bbl. Condor refinery located at Rho, near Milan. Shell acquired majority interest from Condor Spa per L'Industria Petrolifera y Chimica.

Reports from Italy indicate a major expansion program is under consideration. The plant now has a 12,000 bbl. thermofor catalytic cracker, 6,000 bbl. UOP Platformer, a 6,000 bbl. catalytic hydrodesulfurizer, and a 400 bbl. polymerization unit. Crude is fed to the plant through an 82-mile pipeline from Genoa.

Sohio Drills Lake Wildcat

THE FIRST wildcat since last summer on Lake Maracaibo's Block 4 is testing a fault block different from present production.

The Sohio group has started its 14-X, 1½ miles northeast of 2-X pool in Centro Lago field. The well is projected to 13,100 ft. It will test all producing horizons found in the nearby pool.

Centro Lago 11, the latest well completed by the Venezuelan newcomers, tests 2,547 bbl. daily from Eocene upper C sands through a 1-in. choke. The well is a twin to Centro Lago 9. The No. 10, a twin to No. 8, tests 4,347 bbl. daily from the C-2 zone through a 1-in. choke.

Polish Test Is Considered Promising

A WILDCAT in southeastern Poland offers hope that the country's chronic oil shortage may be partly solved.

The test, the Poles say, is the first discovery in the lower Carpathian region. No depth or flow figures were given. The well came in after drilling 3 months. It is about 40 miles north of a 50-bbl.-daily find made last year at Jaslo.

Most of Poland's prewar production, including output by western companies, was from territory absorbed by Russia. Existing production of under 4,000 bbl. daily supplies only a small fraction of local demand. Imports of products and crude from Russia average 26,500 bbl. daily.

Unless the new strike at Mielec makes a sizable dent in the need for imports, 36,000 bbl. daily are expected from Russia by 1960. Russia also is to help build a new 40,000-bbl. refinery proposed under Poland's new 7-year plan.

Venezuelan Crude Prices Cut

. . . on 33 grades from 5 to 15 cents per bbl. Creole says slashes meet competition. Shell, Colon reduce postings.

PRICE CUTS of from 5 to 15 cents a barrel were posted last week on 33 Venezuelan crudes by Cia. Shell de Venezuela, Colon Oil Co., and Creole Petroleum Corp.

The price shaving was started by the Shell companies and followed 3 days later by Creole.

None of the companies gave any reasons for the cuts except Creo'e. It said it was posting the new prices to meet competition.

Shell cut the following crudes 15 cents: Oficina, 35.0-35.9; Paconsib, 33.0-33.9; Lagomar, 31.0-31.9; Mesa, 30.0-30.9; Mara, 29.0-29.9; and Lagotreco, 26.0-26.9. Cut 10 cents were Leona, 24.0-24.9; Orocual, 22.5-22.9; Cabimas, 22.0-22.4 and 20.0-20.4; Temblador, 20.5-20.9; and Tia Juana Viente, 20.0-20.4. Cut 5 cents were Merey, 17; Tararito, 17, and Mara Pesado, 17.

The Colon company, a Shell affiliate, cut Tarra, 38.0-38.9, and Cruces-Manueles, 30.0-30.9, both 15 cents.

Creole cut the following crudes 15 cents: Cumarebo, 48.0-48.9; Mulata, 37.0-37.9; Oficina, 35.0-35.9; Jusepin, 32.0-32.9; Tia Juana light, 31.0-31.9; Guanipa, 30.0-30.9; Mara, 29.0-29.9; Tia Juana medium, 26.0-26.9; La Rosa, 26.0-26.9; Tia Juana 102 low pour, 25.0-25.9; Pedernales, 21.0-21.4; and Temblador, 20.5-20.9.

Creole cut Tigre, 24.0-24.9, 10 cents and Motatan, 21.0-21.4, a nickel a barrel.

Australia Will Pay

one-half cost of four wells with aid up to $375,000.

THE AUSTRALIAN government is paying half the cost of four wells to be drilled this year.

The aid is going to three companies whose programs qualified for help under a new local law. In order to qualify, applicants had to show their program would be likely to turn up significant new geological information to further exploration.

WAPET, owned largely by Caltex and Royal Dutch-Shell, will receive up to $180,000 for a test at Frome Rocks, 50 miles south of Derby, Western Australia. The well will probe a small anticline on a terrance structure where Paleozoic reefs or clean sands may be present.

Australian Oil & Gas Corp. will receive $125,000 for a well at Surat, 50 miles south of Roma, Queensland. The well will be drilled concurrently with seismic surveys in an effort to solve complicated regional geology. The test may also confirm whether the Bowen basin extends southward into the area beneath the Mesozoic.

The same company will drill a well at Camberwell, 50 miles northwest of Newcastle. A subsidy of $45,000 will help in a well aimed at the deeper part of the Permian sequence which has not yet been drilled in Sydney basin. Location is on a well-defined anticline with good closure.

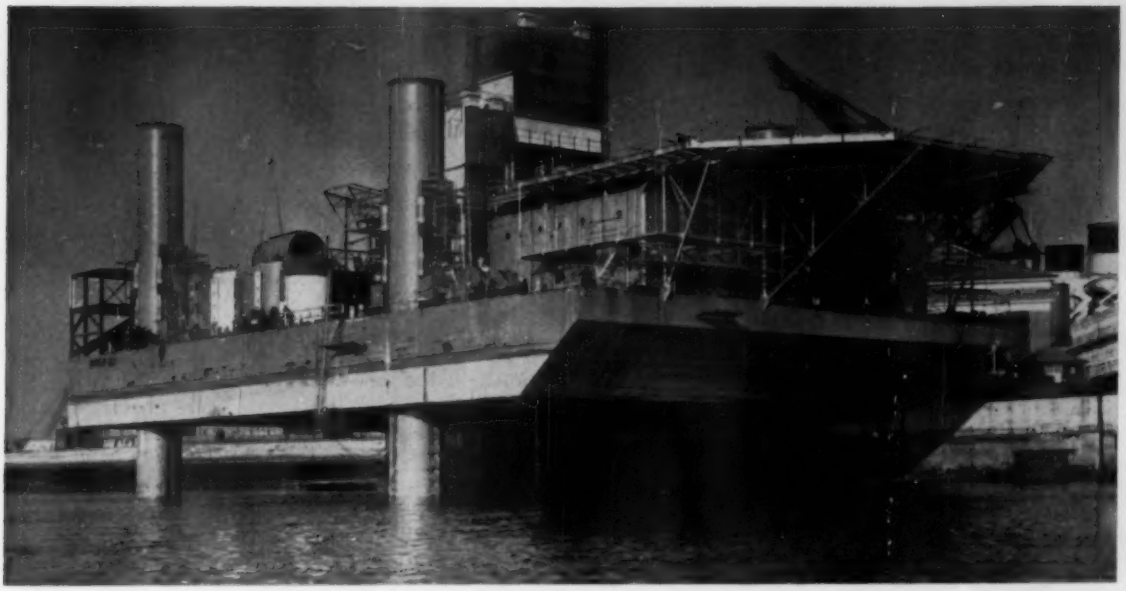
Westralian Oil, Ltd., will receive $25,000 for a test at Spirit Hill, Northern Territory, 70 miles east of Wyndham, Western Australia. The well will study the Devonian sequence in the central part of Burt basin.

Iran Line Capacity Hiked

CAPACITY of the 600-mile Trans-Iranian products pipeline is being expanded from 20,000 bbl. to 50,000 bbl. daily.

Seven pump stations will be added to the 10-in. system from Abadan to Tehran. A contract for diesel engines and electrical equipment at the stations has been awarded to Ruston & Hornsby, Ltd., of England, which installed similar equipment in the six stations now in operation. The company also will supply equipment for a 100-mile extension to the Caspian Sea, that is opening this year.

Contractors on the project are Benson & Montin Construction Co., Oklahoma City, Cheney Construction Co., Seattle, and Merritt, Chapman & Scott.



First British Mobile Platform Will Drill Wildcat Off Borneo

A NEW MOBILE drilling platform is starting the first leg of a 9,200-mile tow from England to the South China Sea.

The Orient Explorer is making the trip from Southampton to British Borneo via the Suez Canal. It is the first drilling barge ever constructed in England. It was built for $2,800,000 by Steel Structures, Ltd., an associate of the John Howard group of engineering companies, and was designed by the De Long Corp. of America. The self-contained unit has air-conditioned living quarters for 56 men and is fitted with a helicopter landing stage.

The platform is designed to withstand winds up to 100 mph. It will be used by Brunei Shell Petroleum Co., Ltd., to continue exploration work in the seas off Borneo. First wildcat will be drilled on a location staked by Brunei Shell 40 miles offshore. Four wells drilled in the area from fixed platforms have been unsuccessful.

WORLD BRIEFS . . .

Construction of a 600-mile, 12-in. products line in Argentina has been subcontracted to Techint, Inc. SARGO, the Argentine representative for Fish Engineering Corp., Houston, and North American Utility & Construction Corp., is prime contractor on the line from Tucuman and the San Lorenzo refinery area northwest of Buenos Aires. Construction is under way.

A 22,400,000-acre block in Australia's Great Artesian basin has been awarded to Magellan Petroleum Corp., formerly Santiago Petroleum. The company also holds 75% interest in another 3,200,000 acres in the same area. A local group, Central Queensland Petroleum of Brisbane, holds the remainder of the smaller tract.

A new thick jointed aluminum pipe will be used for the first time by Superior Oil Co. for underwater flow lines in Lake Maracaibo. Superior will install 8,000 ft. of 6-in., heavy-end pipe produced by Reynolds Metals Co. Aluminum is used in preference to steel because of the corrosion prob'em, Superior said.

Completion is near on a 34-mile, 8-in. crude line from El Rosario to Calvario, Venezuela. Z & P Construction is building the line for Colon Oil Co. A pump station is being installed at Calvario.

A tanker has loaded at an average rate of 52,061 bbl. per hour in a test at Creole Petroleum's Lacustre terminal on Lake Maracaibo. This probable world record was set when Esso Peru loaded 225,423 bbl. of Venezuelan medium crude in 4 hours, 20 minutes.

Eleven water wells, drilled in connection with three dry wildcats, have been presented to the government of Somalia, East Africa, by the Sinclair Somal Corp. They will substantially increase water supplies available for human consumption and for watering of stock in the arid region.

Hungary will start work on a new 20,000-bbl. crude distillation unit this year. It also plans to make over 900,000 ft. of hole in its exploration and development drilling programs.

Completion of Red China's new 100-mile crude pipeline running southward from Karamai field to Tushantze refinery, combined with operation of the line from the Sinkiang province field, will enable throughput at the plant to increase to 8,000 bbl. daily. The Communist Chinese say they increased production to 44,600 bbl. daily last year. The figure may include coal and shale oil produced in northeastern China.

Shell Refining Co. (Philippines) expects to build a 25,500-bbl. refinery on Luzon in 2 or 3 years. A Platformer will be included. Local interests will have at least 25% ownership in the company.

SPECIAL DESIGN PORTABLE METER CALIBRATING TANKS

Tanks shown are part of a shipment to a major oil company's terminals in the Midwest. These tanks are specially designed with triangular frame and caster wheels so they can be moved easily by one man in the terminal loading rack area. Warner Lewis Company welcomes the opportunity to submit designs to meet **your** special requirements. Write for complete information.

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GASOLINE

• Its Processing
• Its Problems

BY LARRY RESEN
Refining Editor

A special 16-page report by The Oil and Gas Journal, devoted to the refiner's greatest over-all problem—how to process crude and split up product streams to give the most economic gasoline blends:

1
What to do with cat reformate
2
Splitting reformate provides premium blending stocks
3
Splitting catalytic naphtha provides more octanes
4
Superfractionation gives flexibility in manufacturing
5
What it takes to fractionate
6
Why remove depressants?
7
Dehexanizing reformate
8
Blending cat stocks
9
What the refiner can expect from catalytic cracking
10
Isomerization of C_5s and C_6s
11
Where to get alkylation feed
12
Better gas recovery improves alkylation feed qualities
13
Selected references on gasoline processing and its problems

MOTOR-FUEL PRODUCTION continues to increase in cost and complexity.

The typical refinery today is a modern processing plant in which millions of dollars have been invested in recent years. During the past decade, the heavy spending has been for units specifically designed to increase the output and quality of gasoline.

Yet today, despite the tremendous outlays for downstream processing units, and despite a slackening in the pace of the octane race, the refiner continues to be faced with a motor-fuel problem. Quantitatively and qualitatively gasoline-manufacturing techniques remain as the refiner's big question mark.

How high **are** octanes going anyway? How can I individually plan to meet the competition? What about rumble? Thud? Sensitivity? Olefins? These are some of the questions he asks himself. The biggest one is: How can I avoid going into the red?

In these pages have been collected some data which may provide at least a clue to a few of the answers. Some of the approaches already being used or under consideration by various companies are presented on a simple, factual basis. No effort has been made to adapt the material to fit any "typical" situation. Since so many different processing techniques are used—even among plants within the same corporate structure—it was felt best to simply publish the data as they are, with a minimum of interpretation. Throughout all of this, the refiner shouldn't lose sight of the old warhorse, tetraethyl lead, which can frequently give him the necessary octane increment at the cheapest cost.

This preface wouldn't be complete without an expression of thanks to the many companies and individuals in the industry who assisted in its compilation. For policy reasons they remain unidentified, but their cooperation is nevertheless gratefully acknowledged.

What to do with catalytic reformate

THE QUESTION of what to do with the full-boiling-range reformate becomes an increasingly important one.

Splitting the output of the reforming unit and then reblending the cuts as desired is one approach. With pool octanes remaining constant by this method, the refiner who is short on these will want to look a bit further, to secondary processing of reformate cuts.

In one study toward this end, a series of first-pass reformates were produced from a platinum catalyst-reformer operating at 500 psig with 85, 90, and 95 research clear octane products. Detailed inspections were made of 5% cuts.

In Fig. 1 and 2 are plots of the research clear octane and leaded octanes vs. the boiling point of the fractions, respectively. These plots show the fractions of the 85 RON reformate boiling above 280° F. have octane ratings significantly higher than those boiling below 280° F. For the higher octanes (90, 95 RON), the high-octane fractions start about 230° F. This is similar to the observations noted in another section. Further inspection here shows that increasing the severity on the i.b.p.-170° F. fraction has very little effect on the quality of this cut. The 170°-280° F. fraction undergoes a general quality improvement from increased severity, with the 230°-280° F. cut showing the greatest improvement.

In Figures 3 and 4 are plots of the aromatic and paraffin contents of the 5% fractions vs. the boiling points. These essentially confirm the previous plots inasmuch as the high-octane fractions have high aromatic contents. For example, the 230°-280° F. fraction which showed the greatest octane improvement with increased severity also underwent a corresponding increase in aromatic content. Further study shows the 230°-280° F. fraction from high-severity operations, i.e., 90-95 RON, would not be suitable for reprocessing since it already contains approximately 90% aromatics. In contrast, this same fraction at the 85-RON severity level contains only about 55% aromatics and consequently could be improved by additional processing.

Table 1 illustrates the quantities of low-octane fractions available for reprocessing. Since the i.b.p.-170° F. fraction is not suitable for further reforming operations because of quality, it will be seen that the 85-RON reformate contains about 48% of low-octane material that could be upgraded while the 95-RON reformate contains only about 18% of a similar material.

A refiner with this material would draw these conclusions:

1. Reprocessing of selected fractions of first-pass reformates may be a feasible approach to the problem of producing 100-plus octanes. The greatest over-all potential exists when first-pass operations are conducted at low severities, 80-85 RON.

2. From standpoint of over-all barrel-octanes the fractions that should be considered in order of desirability are:

   a. 230°-380° F. fraction.
   b. 170°-230° F. fraction.
   c. I.b.p.-170° F. fraction.

3. It's doubtful that the lighter fractions can be economically subjected to additional reforming because of both yield and catalyst-life limitations. These fractions, hence, might be more advantageously processed through some type of isomerization operation.

TABLE 1—REFORMATE FRACTIONS AT VARIOUS SEVERITY LEVELS

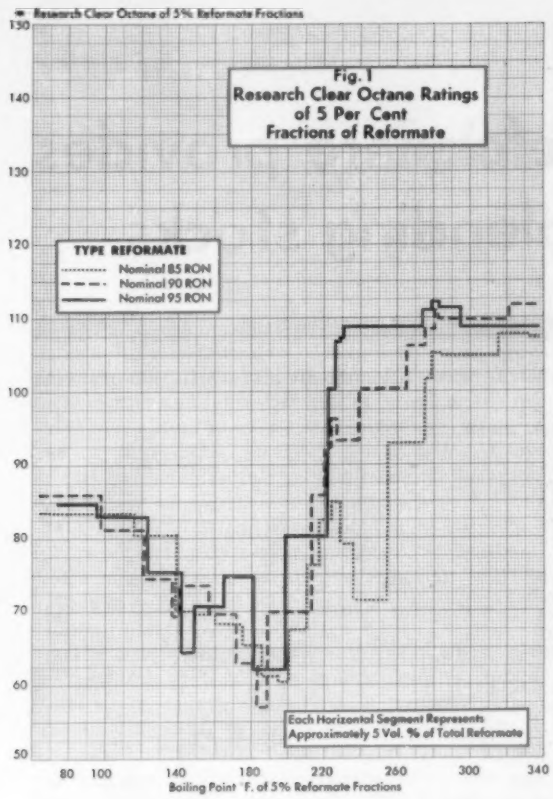
Reformate Octane	85		90		95	
Yield:	Vol. %	RON	Vol. %	RON	Vol. %	RON
Fraction:						
I.b.p.-170°	21.3	74	26.7	75	26.4	75
170°-230°	31.2	71	25.5	77	17.6	84
230°-280°	17.0	86	13.6	102	13.5	108
280-e.p.	15.8	106	14.5	110	15.8	110
Total	85.3	84.0	80.3	89.6	73.3	95.4

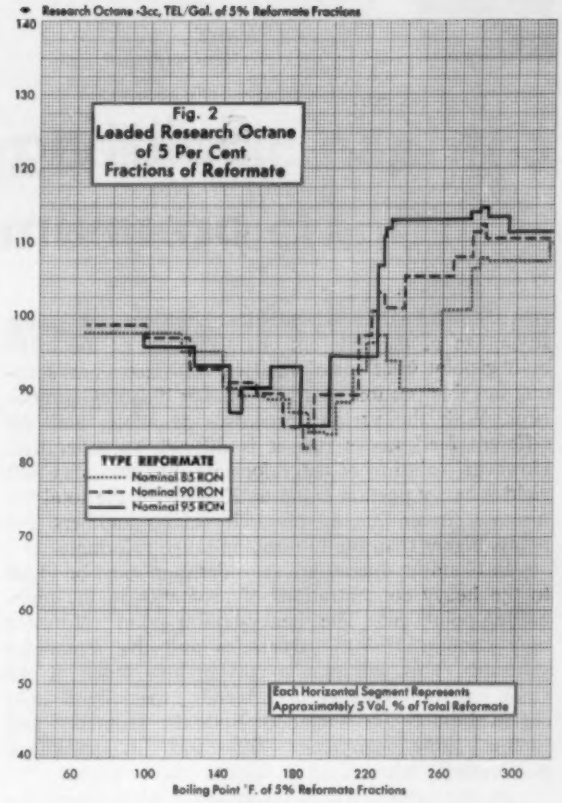
TABLE 2—FEED STOCK USED IN REFORMATE FRACTIONATION STUDY

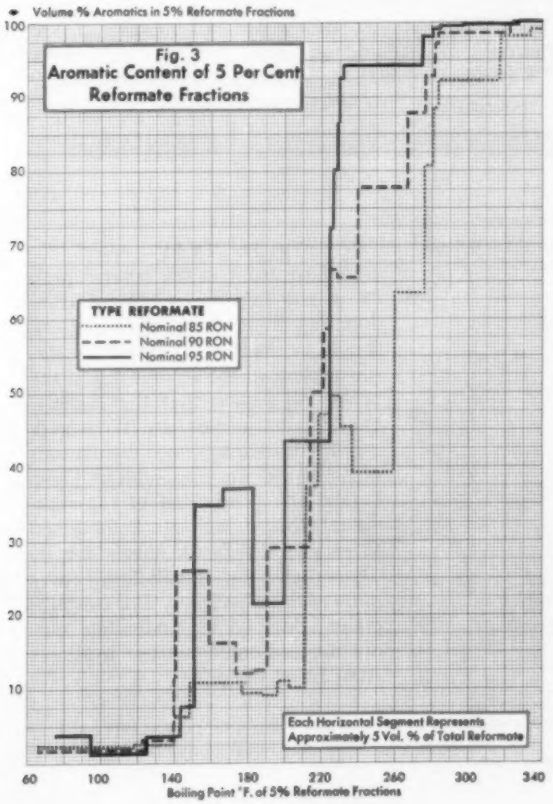
Feed Source	Mid-Continent (??) Naphtha
Gravity, °API	60.1
ASTM distillation, °F.	
I.b.p.	183
10%	204
50	226
90	270
E.p.	299
Rec.	98.0
Res.	0.9
Loss	1.1
PONA content, Vol. %	
Paraffins	50
Olefins	1
Naphthenes	45
Aromatics	4
Sulfur, wt. %	0.008
Chlorine, wt. %	0.002
Arsenic, p.p.b.	4.0
Research octane, neat	55.8
Research octane, plus 3 cc. TEL/gal.	77.5
Motor octane, neat	53.5
Motor octane, plus 3 cc. TEL/gal.	77.7

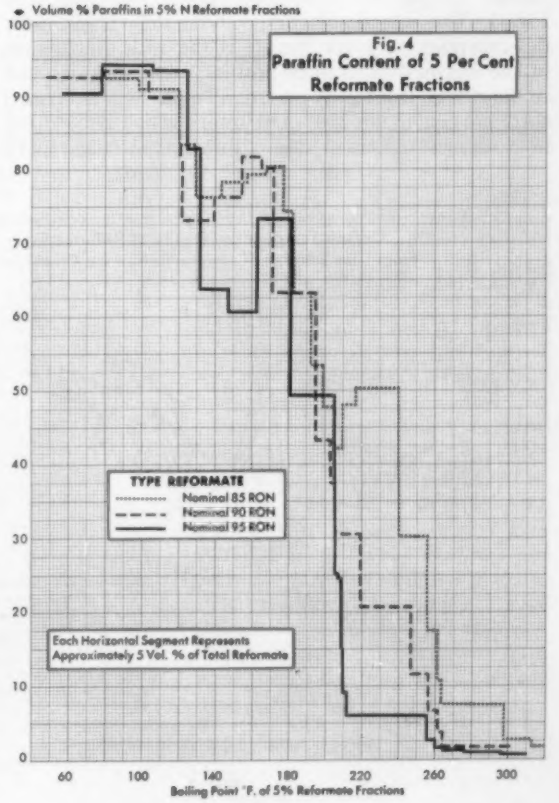
TABLE 3—YIELD SUMMARY

Octane Level	85	90	95
Yields:			
H_2 wt. %	1.3	1.6	1.8
C_1 wt. %	1.5	2.0	2.8
C_2 wt. %	1.9	2.8	3.9
C_3 wt. %	3.3	4.4	5.8
iC_4 vol. %	2.7	3.5	4.9
nC_4 vol. %	3.2	3.9	5.1
C_5-e.p. vol. %	84.5	79.9	73.8


Research Clear Octane of 5% Reformate Fractions
Fig. 1
Research Clear Octane Ratings of 5 Per Cent Fractions of Reformate
TYPE REFORMATE
Nominal 85 RON
Nominal 90 RON
Nominal 95 RON
Each Horizontal Segment Represents Approximately 5 Vol. % of Total Reformate
Boiling Point °F. of 5% Reformate Fractions


Research Octane +3cc, TEL/Gal. of 5% Reformate Fractions
Fig. 2
Leaded Research Octane of 5 Per Cent Fractions of Reformate
TYPE REFORMATE
Nominal 85 RON
Nominal 90 RON
Nominal 95 RON
Each Horizontal Segment Represents Approximately 5 Vol. % of Total Reformate
Boiling Point °F. of 5% Reformate Fractions


Volume % Aromatics in 5% Reformate Fractions
Fig. 3
Aromatic Content of 5 Per Cent Reformate Fractions
TYPE REFORMATE
Nominal 85 RON
Nominal 90 RON
Nominal 95 RON
Each Horizontal Segment Represents Approximately 5 Vol. % of Total Reformate
Boiling Point °F. of 5% Reformate Fractions


Volume % Paraffins in 5% N Reformate Fractions
Fig. 4
Paraffin Content of 5 Per Cent Reformate Fractions
TYPE REFORMATE
Nominal 85 RON
Nominal 90 RON
Nominal 95 RON
Each Horizontal Segment Represents Approximately 5 Vol. % of Total Reformate
Boiling Point °F. of 5% Reformate Fractions

Splitting reformate provides premium blending stocks

AN INCREASING NUMBER of refiners are taking advantage of the inherent characteristics of the high-boiling-point fractions of catalytic reformates and splitting out this portion as a high-quality blending component. With the various processes available, and the different feed stocks run, it is difficult to generalize. However, splitting of the reformate into two cuts will yield a heavy portion equal to 20-40% of the total reformate stream having research octane numbers 2-6 points higher than the full-boiling-range reformate.

In blending operations, consideration must be given to the heavy concentrations of aromatics in the high-boiling-point cut. The heavy-boiling-point reformate may contain 75-90% aromatics and the remainder saturates. This will play a part in how much of the stock can be tolerated in a blend, especially if light cat naphtha is also included. Both the aromatics and olefins show significant differences in antiknock performance when rated at various engine speeds.

In analyzing various reformates, Ethyl Corp. developed data based on analyzing small, 5-10% cuts of the reformates. The octane numbers of these stocks are plotted against the midboiling-point temperatures in Fig. 1. The remarkable thing about the curves, with the exception of stock No. 1, is the wide fluctuation of the octane-temperature profile. While the tail end of the stocks, from 275° on, are all quite high in octane, there are cuts in the 220°-230° range which also exhibit high octanes. On either side of this limited range, there are sharp drops in the octane quality of the reformates. When fractionating these three stocks, a cut should be made to exclude the material present in the second dip of the profile to insure that the highest-quality components are recovered.

The full-boiling-range distillations of the stocks are presented in Table 1, and the proportion of the individual stocks which can be obtained at various distillation levels can be determined by distillation-curve plots of these samples. For simplification, data on the individual cuts are not presented but are available from Ethyl Corp.

TABLE 1—SPECIFICATIONS OF CATALYTIC REFORMATES

Sample	1	2	3	4
ASTM Distillation, °F:				
I.b.p.	94	77	168	86
10%	170	105	212	121
20	222	125	228	144
30	250	146	243	165
40	266	170	258	185
50	280	192	275	207
60	294	214	292	228
70	314	238	308	250
80	330	263	328	276
90	378	298	347	307
95	...	321	...	329
EP	448	374	426	363
Recovery, %	98.0	97.0	99.0	97.0
Residue, %	1.0	0.6	0.8	1.1
Loss, %	1.0	2.4	0.2	1.9
R.v.p., psi.	11.1	12.6	1.4	10.3
Gravity, API	50.0	63.0	46.0	60.8
RON:				
Clear	90.0	...	85.4	82.3
3.0 ml. TEL/gal.	98.3	95.5	95.8	95.6
MON:				
Clear	...	...	78.6	77.0
3.0 ml. TEL/gal.	...	89.8	88.0	89.1
Hydrocarbon type, Vol. %:				
Aromatics	56	25	51	27.4
Olefins	3	3	2	1.8
Paraffins	*41	*72	45	*70.8
Naphthenes	...	...	2	...

*Saturates.

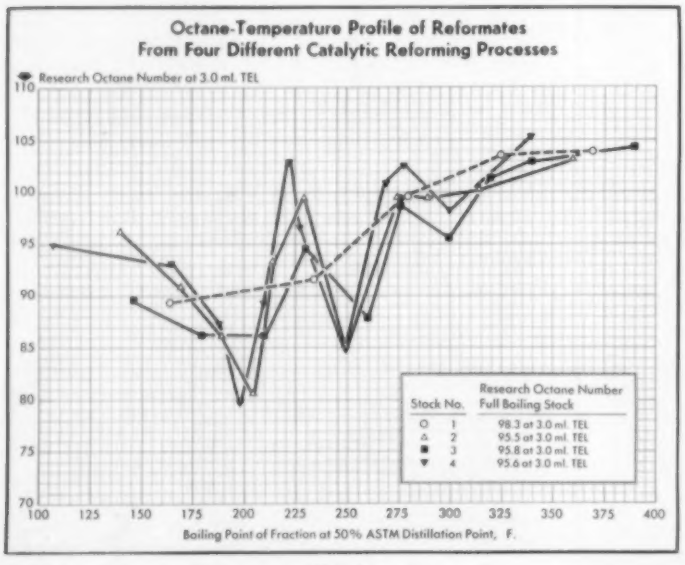


Fig. 1.

Splitting catalytic naphtha provides more octanes

THE USE OF SPLITTERS on cat cracked naphtha streams isn't exactly novel. There are many plants operating without these tail-end towers, however. Use of these can play an important part in providing the refiner with high-octane blending stock inherent in the light end of these naphthas. The only so-called detriment to this operation is that splitting doesn't increase the pool octane of the cat cracked naphthas.

A simple split can result in a light naphtha that is 2 to 4 research octane numbers higher than the whole stream. Volume of this light cut will range anywhere from 30-50% of the naphtha product off the cracking unit.

The wide variations to be anticipated when splitting cat naphthas may be seen in Fig. 1. This, based on Ethyl Corp. data, clearly shows how much individual cuts of individual naphthas can vary. The data are based on making small fractional cuts of the naphthas, and then plotting the octane numbers of the cuts against the midboiling-point temperature of the fraction.

The importance of where to make the cut on individual naphthas is graphically highlighted. While all samples show a preponderance of high-octane material in the boiling range below 175° F., there is a marked divergence among these at higher temperatures. Characteristics of the stocks handled by individual refiners, hence, play an important part in the yields of premium blending stock made available in a splitter. Stock No. 2 as plotted would probably be cut off at the 175° point, while No. 4 would be cut at about 225°. If desired it could be cut at a higher temperature since the octane numbers of the stock fluctuates at a rather high range.

Stock No. 3 is a heavy naphtha which has been hydrogenated. This is evidently a poor-quality stock with the higher boiling components definitely undesirable for any gasoline blending. The ASTM distillations of the full-boiling-range materials are shown in Table 1. For simplification in this presentation, characteristics of the fractions have been omitted, but are available from Ethyl Corp.

TABLE 1—SPECIFICATIONS OF CATALYTICALLY CRACKED NAPHTHAS.

ASTM Distillation, °F.: Sample	1	2	3	4
I.b.p.	104	92	302	88
10%	134	122	322	115
20	152	140	329	137
30	174	159	334	157
40	203	181	340	182
50	235	208	354	240
60	271	240	354	240
70	309	272	364	279
80	343	303	375	319
90	386	335	388	364
95	410	390	396	391
EP	440	..	440	430
Recovery, %	98.0	98.0	99.5	97.0
Loss, %	1.0	0.8	0.5	1.2
Residue, %	1.0	1.2	0.0	1.8
R.v.p.	6.6	8.6	0.5	10.6
Gravity, °API	55.7	59.7	39.6	61.0
RON:				
Clear	91.3	92.3	78.3	93.6
3.0 ml. TEL/gal.	97.7	98.4	89.2	100.3
MON:				
Clear	79.9	80.9	72.7	81.2
3.0 ml. TEL/gal.	85.9	87.7	81.1	87.5
Hydrocarbon type, Vol %				
Aromatics	22	23	48	22.0
Olefins	40	25	4	36.1
Paraffins	28	*52	32	*41.9
Naphthenes	10	...	16	...

*Saturates.

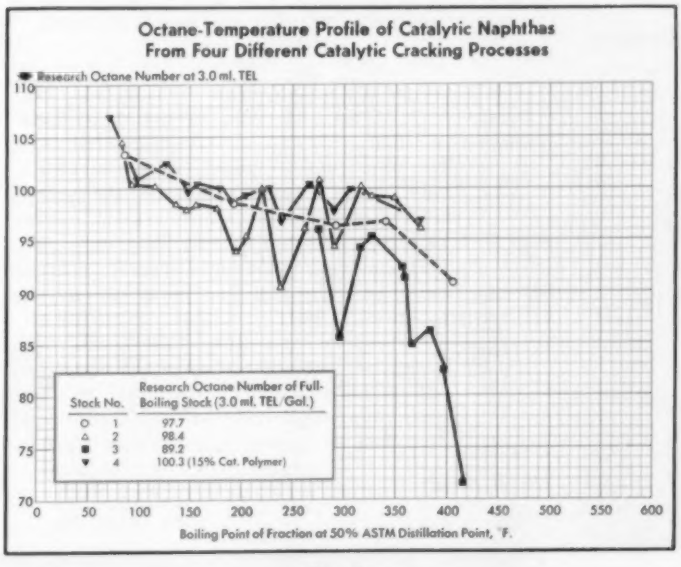


Fig. 1.

Superfractionation gives flexibility in manufacturing gasoline

THE SPLITTING of product streams from cat cracking units and reforming units can be carried beyond the simple cut of the naphtha and reformate into light and heavy fractions. To satisfy individual refinery conditions, additional fractions can be made so the refiner ends up with that many more components with which to work.

Examples of this fractionation-plus approach are seen for a catalytic reformate in Table 1, and a catalytic naphtha in Table 2. Simplified processing schemes for each are Figs. 1 and 2, respectively.

The cat reformate is actually split into four distinctive cuts. The C_6 and lighter fraction is removed as the first cut in the depentanizer overhead. This material is stabilized to motor fuel.

The remaining reformate is then fractionated into three components: the preaviation cut, the aviation-base stock, and the postaviation cut. The "heart cut" of the reformate, which is the aviation base with an exceptionally fine F-4 performance number of 225, is naturally used in the avgas blends. Recovery of this portion of the reformate is accomplished by solvent

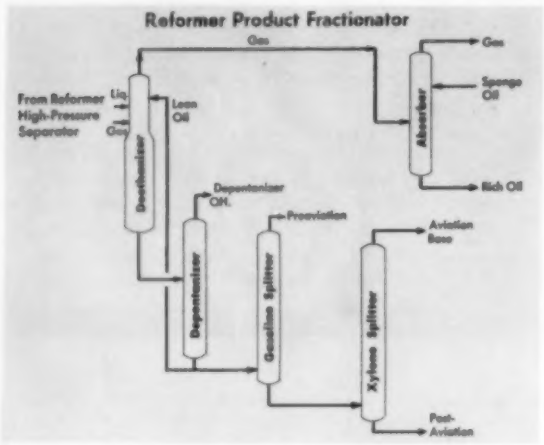


Fig. 1.

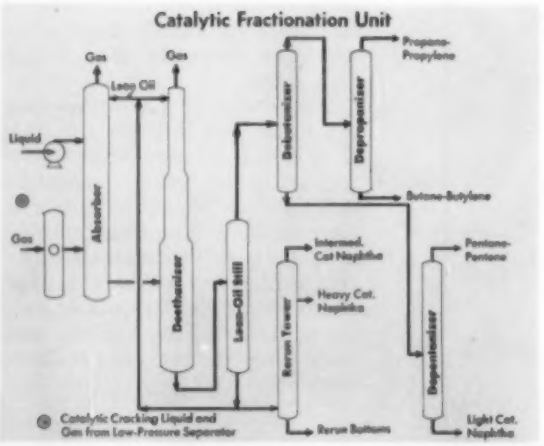


Fig. 2.

TABLE 1—TYPICAL REFORMATE FRACTIONATION

Stream*—	Ref. feed	Depent. OH†	Pre-avia.	Avia. base	Post-avia.
Yield, vol. % based on recovered product	100	37	21	17	25
Inspections:					
Gravity, °API	54	80	47	36	32
ASTM dist., °F.:					
I.b.p.	230	...	216	272	305
10%	246	...	221	274	310
30%	258	...	224	274	315
50%	269	...	228	275	319
70%	282	...	232	276	326
90%	304	...	239	276	340
E.p.	347	...	281	307	395
R.v.p.	0.5	...	1.0	0.3	0.0
Octane number:					
F-1 clear	46	...	...	...	...
F-1 + 2 cc.	...	...	94	...	105
F-4 + 4.6 cc.	...	...	...	225	...

*No inspection data available on unstabilized reformate stream to fractionation section. †This stream contains C_6 and lighter.

TABLE 2—TYPICAL LIGHT END AND NAPHTHA FRACTIONATION FROM FLUID CATALYTIC CRACKING

Stream—	Propane-propylene	Butane-butylene	Pentane-pentene	Cat. naphtha Light	Cat. naphtha Inter-med.	Cat. naphtha Hvy.	Rerun B btms.
Yields, vol. % based on recovered light ends and naphtha products	15	18	4	24	19	15	5
Inspections:							
Gravity, °API	...	...	91	70	50	36	28
ASTM dist., °F.:							
I.b.p.	...	...	...	110	152	274	446
10%	...	...	...	128	202	334	457
30%	...	...	...	138	234	358	460
50%	...	...	...	152	262	376	464
70%	...	...	...	178	290	390	470
90%	...	...	...	220	320	410	482
E.p.	...	...	...	306	370	445	554
R.v.p.	...	...	...	9.0	2.7	0.3	...
Octane number:							
F-1, clear	...	...	...	94.3	92.2	88.9	...
F-1 + 2 cc.	...	...	...	98.6	97.2	94.2	...

extraction in some plants. Here a fractionation system has been geared up to perform this service.

The preaviation and postaviation cuts, which designations simply refer to their position in the fractionation train, are available for motor-fuel blending and also may be used in avgas. The high-octane characteristics of heavy reformates have been discussed earlier, and the postaviation cut is consistent in this respect. Its F-1 octane number of 105 with 2 cc. of TEL makes it a prime quality of motor-fuel blending stock. The light reformate cut (preaviation), meanwhile, makes it satisfactory to go into both premium and housebrands, depending on other blending stocks available. It has a 94 RON, with 2 cc. of TEL.

The catalytic naphtha off the fluid unit undergoes an additional fractionation step to provide an intermediate naphtha fraction. Following removal of light ends and depentanization, the cat cracked liquid stream is split into a light, intermediate, and heavy naphtha cut, with a fourth fraction being the rerun bottoms. Additional flexibility is gained with this approach, for three motor-fuel components are available with 98.6, 97.2, and 94.2 octane numbers, with 2 cc. of TEL. The light naphtha has the highest octane and the heavy naphtha the lowest. The boiling-range spread of each fraction adds to the blending possibilities.

What it takes to fractionate

WHEN SPLITTING various reformate and cat naphtha streams, the additional costs entailed must be considered in the budget. The actual capital investment will be dependent primarily upon availability of existing equipment to fit the bill and the capacity required.

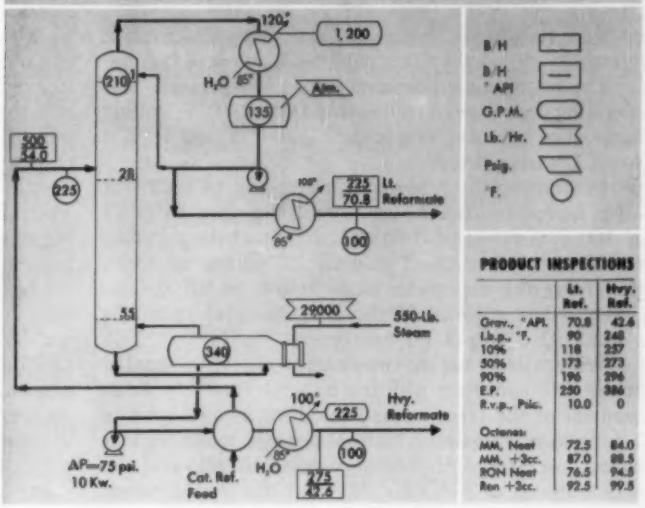
Frequently a tower from an outmoded unit can be refitted to do the job, thereby saving on dollar outlay. In most cases, the splitting facilities can be incorporated into a unit without requiring additional operating personnel, thereby saving additional expenses. Beyond these two points, the main expense will be the operating costs—primarily utilities.

Actual operating costs will vary from locality to locality and it's difficult to pin these down for any and all operations. For simplification, examples of splitting costs have been streamlined to show the requirements for two specific streams. This has been done in Figs. 1 and 2 for catalytic reformate and catalytic naphtha, respectively. Charge streams in both instances are substantial, being 12,000 bbl. daily in the case of the reformate splitter, and over 15,000 bbl. with the naphtha splitter.

The reformate, being trickier, and with the fine cut made requires a much taller tower—55 trays vs. 20 trays for the naphtha splitter. A much cleaner cut is made in the case of the former. Only a 2° F. overlap exists between end point and initial boiling point of the two cuts. A 28° overlap exists in the case of the catalytic naphtha.

Beyond the noted differences, the operations are essentially identical, even to the proportional split between light and heavy cuts. The utility requirements in each case are indicated on the flowsheets.

Utility Requirements for Splitting Cat Reformate

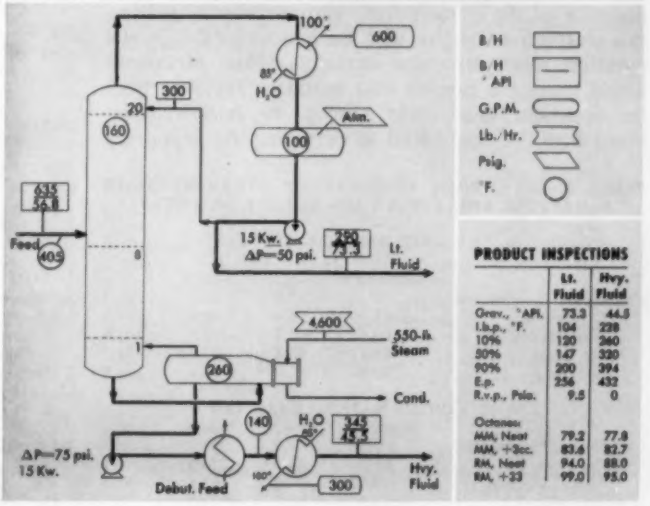


PRODUCT INSPECTIONS

	Lt. Ref.	Hvy. Ref.
Grav., °API.	70.8	42.6
I.b.p., °F.	90	248
10%	118	257
50%	173	273
90%	196	296
E.P.	250	386
R.v.p., Psia.	10.0	0
Octanes:		
MM, Neat	72.5	84.0
MM, +3cc.	87.0	88.5
RON Neat	76.5	94.5
Ron +3cc.	92.5	99.5

Fig. 1.

Utility Requirements for Splitting Cat Naphtha



PRODUCT INSPECTIONS

	Lt. Fluid	Hvy. Fluid
Grav., °API.	73.3	44.5
I.b.p., °F.	104	228
10%	120	260
50%	147	320
90%	200	394
E.p.	256	432
R.v.p., Psia.	9.5	0
Octanes:		
MM, Neat	79.2	77.8
MM, +3cc.	83.6	82.7
RM, Neat	94.0	88.0
RM, +33	99.0	95.0

Fig. 2.

Why remove octane depressants?

WHILE selective fractionation is a coming force in refinery processing, there are questions as to the merits of removing normal paraffins in the C_5-C_7 range strictly for the benefits in quality to be achieved by eliminating these octane depressants from a stock.

With leaded research octane number of the normal C_5, C_6 and C_7 fractions ranging from 88.7 to 65.3 to 43.5, the deletion of these from blending stocks should, on the surface, result in significant gains in octane number of the parent stock. Surprisingly, however, this is not always the case. In Table 1 are shown data expressing the octane numbers to be expected when removing n-pentane, n-hexane, and n-heptane from a reformate and a light virgin naphtha in stepwise fashion.

The reformate is produced from a low-pressure unit operating on a Kuwait feed with a 160°-280° F. boiling range. The light naphtha is the C_5-200° F. cut from a South Louisiana crude.

In studying the reformate first, it will be seen that while leaded full-boiling-range reformate has an RON of 100.4, removal of the three straight-chain paraffins results in a net over-all gain of 3.2 octane numbers. Removing the n-pentane alone results in an 0.8 increase, while removal of the n-hexane also results in a cumulative gain of 1.7 numbers.

With motor octane numbers there is a smaller cumulative gain than with the research numbers. After removal of the three normal paraffins, a total gain of 2.4 numbers is realized. Normal pentane removal alone causes just a 0.4-octane number gain and following this with removal of n-hexane increases the leaded octane number an additional 0.9 unit. It then becomes quite questionable whether separation of these components will be worth while strictly from an octane-improvement standpoint. If a particular plant were anticipating fractionation of the isomers from various refinery streams in a central fractionation unit, the removal of the normal paraffins might be more attractive. This, of course, would mean the isomers also would be removed from the reformate and would have to be selectively reblended to the final blend to overcome the depressing effect their absence from the reformate might cause.

The sensitivity aspect of this fractionation approach deserves some consideration. The research minus motor-octane-number difference increases as normal paraffins are removed from the reformate. The full-boiling-range reformate has a sensitivity of 7.9 while the fraction remaining following removal of all three normal cuts has a sensitivity of 8.7 although this is well within the desirable sensitivity limits, the increase, small as it is, means just that much less of a highly sensitive stock such as light cat naphtha can be tolerated in the final blend.

The effects of removing normal paraffins from a virgin naphtha are shown in the second part of the table. Removing the straight-chain paraffins has a greater effect on the remaining stock than in the case of the reformate. A net gain in octane numbers of 5.2 is experienced when all three of the paraffins under discussion are removed and the leaded RON's are taken. There is a decrease in sensitivity, which is quite low to begin with in this instance. The sensitivity decreases from 1.6 to 1.3 following removal of the n-heptane.

Depending upon the fractionation facilities and economics in individual plants, removal of the normal paraffins from the virgin naphtha shown does have possibilities. It can enhance the attractiveness of natural gasoline to an extent, and also make light straight-run an appealing blending stock. Fractionation and removal of these components could possibly be the first stage or approach to isomerization for a refiner who was not eager to go the whole distance at this time.

TABLE 1—SUCCESSIVE REMOVAL OF STRAIGHT-CHAIN PARAFFINS AND EFFECT ON OCTANE NUMBERS

KUWAIT REFORMATE

	Reformate	$-nC_5$	$-nC_6$	$-nC_7$
Cumulative % removed	0	5.8	10.3	11.7
RON, clear	95	96.4	98.6	99.5
+3cc. (CRC)	100.4	101.2	102.9	103.6
MON, clear	84.9	85.8	87.7	89.7
+3cc.	92.5	92.9	93.8	94.9

LIGHT VIRGIN NAPHTHA (So. La.)

	Naphtha	$-nC_5$	$-nC_6$	$-nC_7$
Cumulative % removed	0	13.8	23.9	26.4
RON, clear	67.0	67.9	73.6	76.1
+3cc.	90.0	90.2	93.5	95.2
MON, clear	66.9	67.7	73.2	75.7
+3cc.	88.4	89.3	92.5	93.9

Dehexanizing reformate

A TOUCH-AND-GO proposition exists when considering the dehexanization of reformer feed stocks. The cost of fractionation has to be balanced out against quality improvement of the resulting reformate. The

TABLE 1—COMPARATIVE YIELDS FOR REFORMING A FULL RANGE AND DEHEXANIZED NAPHTHA
Charge Stock: Mid-Continent Naphtha

C_5 + pool octane No. (RON + 3cc. TEL)	97		100	
Boiling range of reformer charge	C_5-380	180-380	C_5-380	180-380
C_5 + reformate octane No. (RON + 3cc TEL	97	99.5	100	103.9
Reformer yields—				
C_5 + reformate, % Vol.	87.2	84.3	82.2	75.6
Butanes, % Vol.	5.0	6.6	7.1	7.3
Dry gas, % Wt.	6.3	8.8	8.8	13.4
Hydrogen, S.f.c./bbl.	720	800	760	800
C_5 —180 SR gas in pool	..	..	..	..
% Vol. of C_5 —380 Naphtha	..	20.9	..	20.9
RON + 3cc. TEL	..	88.9	..	88.9
Total yields as % of C_5—380 Naphtha—				
C_5 + gasoline, % Vol.	87.2	87.6	82.2	80.7
Butanes, % Vol.	5.0	5.2	7.1	5.8
Dry gas, % Wt.	6.3	7.1	8.8	10.9
Hydrogen, S.f.c./bbl.	720	630	760	630

deciding factor in some cases may be the increased reforming capacity made available to the refiner by cutting out these light ends, which can be reblended in the pool as desired.

In Table 1, a comparison is made of yields obtainable from C_5-380° F. Mid-Continent naphtha when reforming the entire fraction and when reforming only the 180° to 380° F. portion and combining the C_5-plus reformate with the unreformed C_5-180° F. cut. In the second case, reforming severity was adjusted so that the final product was at the same octane level as in the first case.

Two research octane levels, 97 and 100 were investigated. Results show that at the 97-octane level there is about 0.4 vol. % advantage in the C_5-plus yield for reforming only the 180° to 380° F. cut. At the 100-octane level, a 1½ vol. % yield disadvantage results from reforming the dehexanized naphtha cut.

The small differences in yields are close to being within experimental error of the testing procedure. Hence, the choice for the refiner is whether to dehexanize to gain a capacity benefit of about 21%. In this particular case, the operator chose to proceed with dehexanization to increase his over-all output of reformate.

Blending reformate and naphtha

BLENDING OF STOCKS varies considerably among refineries and within a refinery itself depending on changing conditions. Illustrative blends, hence, have dubious value under this situation. With this in mind, blending results to be anticipated when combining light fluid catalytic naphtha and heavy catalytic reformate are presented to give an indication of what may be expected when working with these stocks.

Earlier sections highlighted the sharp octane variations in various fractions of full-boiling-range reformate, and to a lesser extent, those prevalent with catalytic naphthas. The data in Tables 1 and 2 are from different stocks as those previously discussed. They do show what may be expected when heavy reformate and light catalytic naphtha are combined in varying proportions.

Two separate sources of data account for each table. There is some duplication of coverage and some ommissions; both are presented to give as complete a picture as possible. Table 1, for instance, has the distillation-curve data on both stocks, but only gives additional data on two blends. Table 2 has no distillation data on the reformate and naphtha fractions, but gives data on three pressurized blends.

Some Comparisons

There are interesting comparisons between the tables. The 50-50 blends both come close to each other in leaded research octane numbers; 101.7 and 101.1, respectively. Likewise, where heavy reformate is the main component in the blend (70-30; vs. 75-25) leaded octane ratings are comparable 102.0 and 102.4, respectively.

In all cases, there is a depreciation in the reformate octane number as compared to the final blend. This, of course, is offset by the octane's being higher in all cases, than the corresponding light cat naphtha. And while data are not presented, the octane improvement over the full-boiling-range stocks would be much greater.

The advantages from an octane-improvement standpoint of the final premium blend are obvious from this data. Simple splitting of the reformate and naphtha provides the refiner with prime blending stocks which can be reblended as desired. As noted earlier, this approach does not affect pool octane of the plant.

TABLE 1—EXPERIMENTAL BLENDS OF HEAVY REFORMATE AND LIGHT FLUID GASOLINE

Composition—Volume %				
Heavy reformate	100	...	50	70
Light cat naphtha	...	100	50	30
Gravity, API	36.2	74.4	52.9	45.7
R.v.p., psi.	0.1	11.2	6.3	4.2
ASTM Distillations:				
I.b.p.	279	94	110	111
10%	290	115	137	167
50%	304	143	249	297
90%	347	200	329	343
EP	430	230	405	425
Research octanes:				
Clear	98.9	93.0	96.3	97.7
+1.0cc. TEL/gal.	100.7	97.2	99.2	99.9
+3.0cc. TEL/gal.	103.4	99.1	101.7	102.0

TABLE—2 EXPERIMENTAL BLENDS OF HEAVY REFORMATE AND LIGHT FLUID CATALYTIC NAPHTHA

Composition, Vol. %					
Light cat naphtha (I.b.p.-260° F. t.b.p.)	100	...	22.4(25)	46.6(50)	73.1(75)
Heavy reformate (260° F. t.b.p.-e.p.)	...	100	67.4(75)	46.6(50)	24.4(25)
Normal butane	...	...	10.2	6.8	2.5
Gravity API	...	...	48.3	53.9	60.6
ASTM distillation:					
I.b.p.	...	...	89	90	89
5%	...	...	120	115	121
10	...	...	149	131	132
20	...	...	217	160	147
30	...	...	261	196	162
40	...	...	277	228	179
50	...	...	284	253	197
60	...	...	291	271	220
70	...	...	299	284	243
80	...	...	308	297	265
90	...	...	335	320	296
95	...	...	360	335	318
D.p.	...	...	372	350	352
E.p.	...	...	375	352	354
Rec.	...	...	95.0	98.0	98.0
Res.	...	...	0.8	0.9	0.8
Loss	...	...	4.2	1.1	1.2
R.v.p. psi.	...	...	9.8	8.9	7.7
RON:					
Clear	91.2	99.5	97.3	96.0	93.4
+3cc. TEL/gal.	98.4	103.3	102.4	101.1	99.6

What the refiner can expect from catalytic cracking

WHILE MOST of the glamour and attention in the past few years has been focused on reforming, alkylation, and isomerization, the very significant catalytic cracking unit cannot be overlooked. While it is true that full boiling range catalytic naphtha is falling behind in the octane race, the high volumes of gasolines produced from these units give them a very heavy voice in the total motor fuel picture. Additionally their boiling range characteristics, chiefly on the light side, are quite desirable and necessary in blends.

Efforts, of course, are being made to increase the octanes of cat naphthas through such means as splitting, catalyst changes, and hydrogenation, to make them meet the high demands of today's premium blends. However, an important factor to consider are the future octane demands on the housebrand motor fuels. The premiums and superpremiums have basked in the limelight, it's true. But while they promise to inch upwards in the years ahead, the housebrands are going to make bigger strides and narrow the existing gap. And this promises to cause an increasing emphasis on higher cat naphtha yields.

This seeming paradox—a desire for more catalytic naphthas at the same time their use in premium grades is on the wane—can be explained easily by studying the anticipated needs of the cars on the road in the days ahead. On the basis of recent trends in compression ratios and octane requirements, the biggest gain in octane needs will come in the group with the lowest ratios. The pressure on the refiners will come from below. An increasing number of cars are being built which—while on the "low" side in octane needs today—are pushing up the housebrand octane demands. The great volume of these cars which will be on the road a few years hence will be demanding higher octanes. And these will be the older cars—the ones normally satisfied by the housebrand grades. Even without a sharp increase in compression ratios, the obsolescence factor means that each year more and more of the newer cars will be on the road, increasing the pressure on octanes in both grades.

Octane numbers promise to increase in both types of motor fuels. Predictions vary from conservative increases to rather bullish outlooks. Premium grades are anticipated around 102 for 1963. This is a big jump over the 99.0 average prevailing at the beginning of this year, for the domestic U. S. housebrand motor fuel, which averaged 91.5 at the start of 1959, is expected to increase at a somewhat faster rate. Predictions range from 95 to 97 for this grade. While the higher figure is open to question, it isn't necessarily far-fetched, especially on a regional basis. Housebrand motor fuels in the Northeast are running above 93 octane at the present time. But no matter what the proportion of regular to premium in existence at that time, it will mean that a considerable volume of what is now the prevailing premium grade will be required to make the motor-fuel blends.

Catalytic cracking, then, promises to remain a potent factor in the motor-fuel picture, despite increasing use of alkylate and aromatics in the premiums and superpremiums. Several routes loom as a means of increasing yields, and also increasing throughputs of individual units.

Catalysts . . . Changing catalyst in the unit is one of the simplest methods of altering cat. cracker outputs. Developments by catalyst manufacturers have resulted in materials which have a marked effect on operations. In Table 1 data are presented on a fluid cat. cracker using high-alumina instead of low-alumina catalyst. In Table 2 a comparison is made of a moving-bed unit before and after kaolin catalyst was substituted in preference to bentonite clay.

Alumina content of the catalyst in Table 1 has been increased to 21% from the previous 13%. Conversion was held at about the same level; 70.7% before and 69.1% after. A lower catalyst inventory in reactor and regenerator was possible, and a catalyst-to-oil ratio dropped from 10.1 to 8.7 with the increased alumina. Reactor-bed temperature was lowered from 904 to 888° F. and use of stripping steam was considerably lower; dropping from 5,280 to 3,080 lb. per hour with the high alumina. The CO_2/CO ratio dropped significantly from 1.67 to 0.94, and UOP weight activity also changed sharply, from 28 to a healthy 41.

Commercial experience with kaolin catalyst may be seen in Table 2, with kaolin content being 60-80% of total catalyst charge in the unit formerly charged with bentonite clay. The increased unit activity of kaolin permitted a 20% increase in virgin charge and additionally permitted a slightly higher conversion, even with the higher charge rate. Conversion increased from 50.2 to 51.7 vol. %. Total gasoline yield increased more than 1 vol. % and yields of the lighter hydrocarbons decreased. Reactor temperatures were lowered but in addition to the higher conversion maintained, gasoline octane rating was increased.

Additional data and information are available in the literature on these and other catalyst improvements. These examples simply give an indication of possible achievements to be gained by this route.

Preheat . . . A controversial point, but one which seems to be getting more proponents, is the desirability of preheating cat. cracker charge streams. Experience with many commercial units shows that preheat is not limited to its effect on the heat balance of the unit. Additionally, it has a marked effect on the process affecting both product distribution and plant capacity. This

influence is a direct result of its effect on reducing the catalyst-to-oil ratio. Preheat has its greatest effect on units designed with little or no preheat; the so-called heat-balance units.

In Table 1 is shown a tabulation of the effect of preheating the virgin gas-oil to 312° F. Less-detailed data on experience with preheat are given in the examples below:

1. The combined feed temperature was increased from its normal value of 340° F. to about 480° F. This was accomplished by bringing hot coker gas oil directly to the unit—skipping intermediate storage. Coke made on fresh feed was reduced from about 7.7 wt. % down to about 6.6 wt. % at the same fresh feed rate and conversion level. The unit is a heat-balanced one and there has been no perceptible rise in the regenerator dense phase temperature. It's been possible to increase fresh feed rate by better than 6% at a given conversion level by maintaining feed at a level of 480°-500° F.

2. A feed preheater was used to raise charge temperature from 250°-400° F. A 10% reduction in coke laydown was experienced without any change in regenerator temperature. The 10% coke reduction, incidentally, was on a rather light feed, and more no doubt would result from use of a heavier feed.

3. At higher preheat ranges (550° and 660° F.) greater conversions were experienced with the same coke laydown. At the 550° F. preheat the unit operated at 61% conversion and 6 wt. % coke. Then with 6% coke yield and the 660° F. preheat a 62% conversion was achieved. The cat./oil ratio with the 550° F. preheat was around 8 to 9. This dropped down to a 6 to 7 range at constant conversion.

The benefit of using feed preheat to reduce cat./oil ratios is still open to question. An alternate approach suggested is to let the regenerator run at a higher temperature which would reduce the cat./oil ratio and hence the coke yield. Nevertheless, some concrete results have been achieved by using preheat as noted.

Hydrogen . . . As more and more demands are made on the catalytic crackers hydrogenation begins to enter the process scene. Both feed and products of the unit will be exposed to hydrogen treating in the days to come. First to be affected will be the feed and cycle stock in order to get improved product distribution. Down the line looms the possibility that part of the cat naphthas will require catalytic reforming following hydrotreating. This latter thought is one to cause even the most hardened refiner to shudder. It's bad enough that straightrun and thermal naphthas require upgrading but the thought of catalytic naphtha also becoming an intermediate is a rough one to contemplate.

Commercial hydrotreating of cat. cracker feeds has been the first to come. This will move slowly, although a few plants are now dabbling with this already, and others admit they are exploring this avenue quite seriously. Data are quite skimpy on this application, although Shell Oil Co. of Canada, Ltd., has reported its experience on a commercial unit. The results did reflect pilot-plant work predicting a better yield structure and product distribution as a result of hydrotreating feed.

Laboratory and pilot plant catalytic cracking of a variety of hydrogenated feed stocks showed coke yields decreased as much as 65% and gasoline yields increased up to 20%. At the same time, sulfur and nitrogen contents were reduced to low levels and octane numbers of the cat. naphtha improved. On the commercial run, at relatively mild hydrogenation levels, the gasoline yield increased about 7% while the de-

TABLE 1—CAT. CRACKER WITH HIGH ALUMINA CATALYST AND PRE-HEATED CHARGE

	Low alumina, B/SD	High alumina, B/SD	With preheat, B/SD
Virgin gas-oil	12,606	15,040	17,000
Cycle oil	15,440	9,350	10,080
Total charge	28,046	24,390	27,080
Recycle ratio	1.225	0.622	0.593
Yields:			
Debutanized light gaso.	5,364	5,277	5,926
Heavy gaso.	.....	1,176	1,075
Butanes	2,228	2,661	2,417
Propanes	850	1,038	1,257
Light cycle oil	3,468	3,557	4,138
Heavy slurry oil	226	1,080	1,140
Fuel gas (M.c.f.)	3,684	3,378	4,560
Conv., %	70.7	69.1	69.0
Operating conditions:			
Reactor:			
Virgin oil temp., °F.	80	136	255
Comb. feed temp., °F.	372	280	374
Bed temp., °F.	904	888	908
Cat./oil ratio	10.1	8.7	7.9
Stripping steam, lb./hr.	5,280	3,080	3,996
Regenerator:			
Stack temp., °F.	1,242	1,210	1,215
Wt. % carbon on reg. catalyst	0.63	0.55	0.48
Cat. activity, UOP	28.0	41.0	42.0
CO_2/CO ratio	1.67	0.94	0.89
Carbon burned, lb./hr.	17,070	19,310	19,620
Total coke, lb./hr.	18,610	21,340	21,330
Alumina, %	13	21	23

TABLE 2—CAT. CRACKING WITH KAOLIN CATALYST COMPARED WITH BENTONITE CLAY

	Before Kaolin	After Kaolin
Kaolin in unit catalyst, wt. %	0	60-80
Operating conditions:		
Virgin gas-oil, bbl./month	150,860	183,141
Recycle charge, bbl./month	34,395	29,752
Total charge, bbl./month	185,255	212,893
Recycle ratio	0.23	0.17
Reactor outlet temp., °F.	864	849
Catalyst circ., T/hr.	131	122
Yields—fresh-feed basis:		
Conversion, vol. %	50.2	51.7
Gasoline, vol. %	39.1	40.4
Poly gaso. (C_4 only), vol. %	2.2	2.2
C_4 cut (after poly), vol. %	2.5	3.8
C_3 cut, vol. %	2.0	2.0
C_2 & ltr. (FOE basis), vol. %	6.0	4.7
Coke, lb./hr.	4,300	3,600
Gasoline octane rating, F-1 + 3 cc. TEL	95.4	95.8
Catalyst residual carbon, wt. %	0.42	0.03

crease in combined yield of coke and ethane and lighter ran about 25%.

Two-stage . . . The acceptance that reaction in a cat. cracker begins when the oil and catalyst first meet has led to the development of two-stage fluid cracking. This has been evidenced in Humble Oil & Refining Co.'s "transfer line reactor" and Shell Oil Co.'s riser-reactor installation at Anacortes, Wash. Basic approach is to give the catalyst and oil a little extra chance to react before completing the reaction within the reactor proper.

Shell's experience with two-stage cracking indicates a much higher gasoline output can be realized. Using three different feed stocks, gasoline yield increased from a 49.9 to 55.5% range to a 64.8 to 67.7% range. Somewhat higher gas makes are experienced with the two-stage process, but this can be explained to a great degree by the higher reactor temperatures, running up as high as 1,000° F., compared to a 900° F. in the single-pass units under consideration for the runs.

One of the most important aspects, however, is the degree of operating flexibility that can be obtained. Gasoline yield, for instance, can be increased by incorporating recycle into one of the cracking stages. And in periods of high demand for intermediate yield of light gas oil can be increased substantially by charging only heavy gas oil to the second stage.

Other possibilities . . . A great deal of work is being done to improve on catalytic cracking. A possibility noted above is the utilization of low-quality naphthas as reforming feed stock, following proper treatment. Another is the use of oxygen to increase coke-burning capacity. A third is the use of heavy residual fuel as the feed stock.

Isomerization of C_5's and C_6's

ISOMERIZATION of the C_5-C_6 component has been heralded as the next big processing step for the refiner. Despite a tremendous buildup, there has been a general dragging of feet, and only a handful of commercial units are in the works. In fact, butane isomerization, to provide isobutane feed stock for alkylation units, has been moving almost as fast.

The reluctance on the part of refiners to move in this direction has been largely an economic one. Upgrading of any gasoline fraction is always a costly operation and isomerization is not an exception in this regard. Many plants have been able to "make do" by increasing reformer severity, diverting alkylate into motor fuel, and employing such processing techniques as selective fractionation. As long at it's possible to get over the hump without adding a complete unit, things will move slowly so far as adding a new process unit goes. As the pressure on motor fuel quality increases, however, isomerization wil play a much bigger role, over a million barrels of C_5-C_6 paraffins being available daily. Hence, a quick look at the process is in order.

Several companies have come up with their own process schemes, including Universal Oil Products Co.'s Penex; M. W. Kellogg Co.'s Iso-Kel; Atlantic Refining Co.'s Pentafining; Pure Oil Co.'s Isomerate, and Standard Oil Co.'s (Indiana) Isomate. In addition Esso Research & Engineering Co. is due to announce a process late this spring, and Houdry Process Co.'s dehydrogenation process has a potential role in the over-all picture.

The only available commercial data are on Phillips Petroleum Co.'s Penex unit at its Borger, Tex., plant for pentane isomerization. This unit went on stream designed to handle a maximum of 34,400 bbl. of 85% normal pentane reactor feed and to produce approximately 16,000 bbl. per day of 95% isopentane. In early runs with a charge rate of about 26,500 bbl. (about 80% of reactor capacity) isopentane product amounted to 60.3 vol. % of the C_5 paraffins in the reactor product. Yield of 96% isopentane amounted to approximately 12,500 bbl.

Most of the isomerization processes, including Penex which in the Phillips case is limited to pentane upgrading, are primarily designed to handle both C_5 and C_6 charge stocks. It is practical to include C_7 as a possible charge. In all of the processes, isomerization gets increasingly complex with each additional carbon atom. Thus pentane isomerization with only the simple isomers to contend with is the easiest process of the lot. Hexane isomerization is complicated due to the larger number of paraffin types and the cyclic compounds appearing in the reactor product. And heptane becomes that much more complex in its products. At the same time, the octane appreciation is greater with the heavier charges, increasing from near zero to around 100 leaded in the case of heptane charges. The incentive and the problems thus both grow as the paraffin chain does.

A big question facing the potential user of an isomerization process is when to fractionate. Whether to split a charge before or after processing is at the option of the individual refiner. Practically, it will be dictated by the feed composition and the yields desired. Thus, the average pentane charge will be high in isopentane content, as much as 45%. On a once-through operation without recycle, the output will contain only about 60% isopentane. Hence, the presence of the isomer in the feed will severly limit the extent of upgrading, and deisopentanization would be normal practice in this case.

In the case of hexane isomerization, the concentration of the n-hexane in the feed is the determining factor. When the percentage of n-hexane in the feed is above 55%, it's generally best to process the entire stream. Below this it is best to fractionate first.

Volatility . . . One point which hasn't received too much attention in the over-all treatment of isomerization has been the volatility consideration. The branched-

TABLE 1—PENTANE ISOMERIZATION DATA (PENEX)

	Pilot plant	
	Feed (mixed C_5's)	Isopentane product
Yields, vol. % of feed	100.0	99.0 (95 vol. % iC_5)
Octane rating:		
F-1 clear	76.4	90.4
+3 cc. TEL	94.5	104.2
R.v.p., psi.	18.2	21.1

	Commercial plant
Isopentane produced:	
Vol. % of n-pentane disappearance	100.1
Mole % of n-pentane disappearance	99.1
Isopentane, Vol. % of C_5 paraffins in reactor product	60.3
Isopentane product:	
Vol. % isopentane	96.0
RON, clear	*95.6
+3 cc. TEL	*104.1

*Blending numbers in alkylate.

TABLE 2—HEXANE ISOMERIZATION (PENTAFINING)

	Mid-Continent		Middle East
	Paraffinic	Naphthenic	
C_6 Charge:			
ASTM RON, clear	46.8	66.6	59.8
ASTM RON, +3 cc. TEL	78.0	89.4	85.6
R.v.p., psi.	5.2	5.2	5.4
C_6 product:			
ASTM RON, clear	70.4	76.2	73.3
ASTM RON +3 cc. TEL	91.8	95.0	93.3
R.v.p., psi.	6.1	5.6	5.9
Charge, % by vol.	94.3	97.3	96.5

TABLE 3—PENTANE-HEXANE ISOMERIZATION (ISO-KEL)

	Kuwait		Mid-Cont.	
Total C_5-C_6	Feed	Product	Feed	Product
Vol. %	100.0	98.6	100.0	98.3
CFRR ON:				
Clear	64.1	79.0	63.0	78.0
+3 cc. TEL	88.2	96.0	86.5	95.0
iC_5 Fraction:				
Vol. % of total	45.0	45.0	34.5	34.5
CFRR ON:				
Clear	74.4	92.0	72.9	92.0
+3 cc. TEL	95.8	104.0	94.5	104.0
iC_6 Fraction:				
Vol. % of total	55.0	53.6	65.5	63.8
CFRR ON:				
Clear	55.9	68.0	57.7	70.5
+3 cc. TEL	82.0	89.0	82.3	90.0

TABLE 4—PENTANE-HEXANE ISOMERIZATION (ISOMATE)

		C_5+ Products			
			Recycle		
	Feed	Once through	Neo-hexane product	Naph-thenic product	Com-bined product
Gravity, API	82.6	84.5	86.8	59.4	85.7
R.v.p., psi.	10.1	12.1	13.4	3.7	13.1
Res. ON:					
Clear	70	83	90	71	89.5
+3 cc. TEL	88	97	101.4	85	101
Yield, vol. %:					
C_5+		97.3	92.7	3.0	95.7
Butanes		2.9	4.5	..	..

chain isomers in each case have higher Reid vapor pressures than the straight-chain paraffin. For example, the R.v.p. of n-pentane is 16, while that of isopentane is 22. Although over-all volumes will be small, nevertheless, the subsitution of isomers for the corresponding normal paraffin means a higher vapor pressure in the final blend.

Basically, it means a high-vapor-pressure component must be removed. With butane used to pressure up the final blend, less of this can then be tolerated. This is a detriment which must be taken into consideration, for it stands both as a high-octane, and especially, low-cost, component.

Economics . . . Investment costs for the different processes available range quite widely. Published estimates call for anywhere from $100-$400 per barrel for a unit without recycle operation and up to $800 per barrel including recycle. These costs are generally for moderate-sized units around 2,000 bbl. daily. Operating costs vary from one area to another, but range from 16 to 30 cents per barrel for the units, depending on type of operation and location. A better estimate is the research octane number per barrel cost, and this ranges from 8-10 cents.

Data on four different commercial processes are given in Tables 1-4. These generally show the yields and octane improvement to be expected when isomerizing pentanes, pentane-hexane, and hexane.

Where to get alkylation feed stocks

THE EMERGENCE of alkylate as a major factor in motor-fuel blends is tied in directly with its high quality—leaded RON ratings of 104 and better—and its superior performance. With a minus sensitivity, it has none of the drawbacks of olefinic fuels, and in fact, is able to offset the ill effects of highly sensitive components in blends.

The hesitancy with which many refiners approached alkylate as a motor-fuel component—as opposed to a highly remunerative avgas stock—was in the past primarily an economic one. The question asked was: How can I afford to blend an avgas component selling at better than 17 cents into a premium motor fuel commanding only a 14-cent price? The answer was: To stay competitive I must utilize alkylate and consider its value on the basis of its worth as an octane improver.

As a result of this competition, and also with the improved economic picture when it is blended into the third-grade superpremiums, motor alkylate has been playing a bigger and bigger part in the fuel picture. In fact, many plants have been started up recently expressly for the production of motor alkylate rather than avgas. It's becoming increasingly common to find as much as 30-35% alkylate in the superpremium grades. A modest 5% is the more prevalent amount in the premium blends, although a few two-grade marketers are actually blending as much as 35% alkylate into the top fuel.

The theoretical question is now being replaced by a practical operational query: Where are my feed stocks coming from? With respect to isobutane, partially purchased from outside sources, it's meant higher prices and a tighter market. Much of that used in refineries is coming from field processing plants. However, several companies have gone to the length of building butane isomerization units at their plants.

With the olefins, however, it's been a case of propylene, and to some extent, amylene, playing a larger part in alkylation. Butylenes, the prime feed stock, are highly desired because of the high-quality alkylate produced, and their low acid consumption. Propylene consumes more acid, but this has not been an important enough deterrent to outweigh its utilization when feed stocks are needed. Magnolia Petroleum Co., for instance, recently put an 8,000-bbl. unit into operation specifically for alkylating high-propylene feed stocks.

Use of Amylenes

Amylenes are used to a much lesser extent than the other olefins. Here their initial octane value weighs against them in an economic evaluation. And in many instances they are included only on a marginal, in-and-out basis. When olefin stocks become temporarily short, amylenes will be included in the charge. At other times, they will only be included when making aviation alkylate. With their inherent high octane, it's touch and go whether they can be economically justified for motor alkylate production.

The long-term outlook is for alkylate output to increase rapidly with a companion demand being exerted on olefin stocks. With this in mind, Tables 1 and 2 list typical operating data on sulfuric and hydrofluoric acid units as guideposts. Different cases were selected to show effects with varying olefin content in feed stocks. Data were obtained from a wide variety of sources, and complete data are not available in each instance. Changes in operating conditions, such as lower reactor temperatures or higher isobutane/olefin ratios will make it possible to alter individual quality-yield relationships.

Alky operating tips: Hold propylene content below 30% of olefin stream to maintain low acid consumption rate.

Maintain low reactor temperatures and low space velocities.

Where possible keep isobutane/olefin ratios high. A minimum of 6:1 is suggested with highs of 12:1 desirable if the isomer is available.

TABLE 2—HYDROFLUORIC ACID ALKYLATION UNIT DATA

Case	A	B	C	D	E
Yield-vol. % on olefins:					
Total alkylate	177	165	176	...	...
Light alkylate	157	153	143	175	...
Isobutane consumption:					
iC_4/olefin	1.50	1.20	1.21	...	1.58
Acid consumption:					
Lb./bbl.	...	0.21	0.303	0.25	0.5
Olefin dist. in charge:					
C_3	100	45	31	30.1	...
C_4	...	55	69	64	*
C_5	...	...	...	5.9	*
Isobutane/olefin ratio	8.26	7.06	5	9	7.03
Reactor temp. °F.	79	89	70	80	109
Alkylate inspections:					
Total alky:					
RON. clear	85.7	91.0	...	...	...
+3 cc. TEL	99.0	103.4	...	...	...
R.v.p.	2.4	0.8	...	...	...
Light alky:					
RON. clear	92.3	93.5	94.3	...	...
+3 cc. TEL	...	104.9	...		...
F-3+4.6 cc.	...		...	119-120	...
F-4+4.6 cc.	...		...	140-142	143.6

*Primarily butylenes, about 5-10% amylenes.

TABLE 1—SULFURIC ACID ALKYLATION UNIT DATA.

Case	A	B	C	D	E	F	H	I	J
Yield-vol. % on olefins:									
Total alkylate	172	160	166	185	...	176	...	...	...
Lt. alkylate	153-165	140-149	145	162	...	165	...	...	...
Isobutane consumption:									
iC_4/olefin	1.106	0.965	1.16	1.3	...	1.19	...	...	...
Acid consumption:									
lb./gal.	0.4-0.6	1.0	1.53	1.26	1.1	0.48	0.4	0.3	0.95
Olefin dist. in charge, vol. %:									
C_3	...	...	28.9	25.8	85	...	...	...	...
C_4	100	...	53.3	67.2	15	100	100	100	...
C_5	...	100	17.8	7.0	...	...	...	...	...
Isobutane/Olefin Ratio	...	...	...	...	9.28	5.97	...	12	...
Isobutane in effluent, Liq. vol. %	...	...							
Reactor temp. °F.	...	...	43.2	56.5	65.0	...	...	...	...
Alkylate inspections:			45	40	53	39	42	40-45	...
Total alky:									
RON, clear	...	...	...	...	91.5	...	95.6	96.8	...
+3 cc. TEL	...	...	...	...	103.5	...	iso+.88	iso+1.0	...
R.v.p.	...	...	...	...	4.5	...	3.3	3.0	...
Light alky:									
RON, clear	94-97	92-93	...	...	...	96.0	95.9	...	...
+3 cc. TEL	104.2-106.2	103-103.7	...	...	...	...	iso+.97	...	...
F-3+4.6 cc.	...	...	106.2	106.5	...	...	125.7	...	...
F-4+4.6 cc.	...	...	143.9	146.1	141.0	...	159.5	165 (calc.)	...
R.v.p.	...	...	5.5	7.2	...	4.0	4.3	4.6	...

Better gas recovery improves alkylation feed qualities

SEGREGATED HANDLING of feed stocks as well as selective blending of products plays its part in providing a plant with the means to get the most octane improvement out of a barrel of charge. And feed stock handling takes on many aspects as seen by installations at Standard Oil Co. of Ohio's Toledo plant and Magnolia Petroleum Co.'s Beaumont, Tex., refinery. In both of these cases, special gas-recovery installations were included to improve the quality of feed available for alkylate operations. The two installations are markedly different as seen in Figs. 1 and 2. The Standard facilities (Fig. 1) actually include two separate gas-recovery plants with gas charges to the plants segregated to take advantage of inherent characteristics on the basis of saturate and unsaturate content. The Magnolia operation seeks recovery of propylenes for charge to a new alkylation unit operating on a propylene-rich stream, and butylene-rich alkylation-plant charge.

Both refineries have simply taken another step in the direction of tailored process. And this isolating of process streams and components is part of an over-all industry trend.

The saturate gas-recovery operation at the Toledo plant receives liquid effluent and wet gas from the hydrogenation section, net make gas from reformer, wet gas and overhead liquids from the reformer debutanizer, a mixed isobutane-normal butane stream from the alkylation plant, and a purchased C_4 stream. The system is designed to recover 95% of the butanes, not less than 70% of the propanes, and to produce a C_3 product essentially free of ethane. The mixed butane stream is recovered 100% as a liquid.

The unsaturate system processes light ends from the crude and coking units, the cat cracker fractionator overhead, and depropanized gasoline from the poly unit. Products from the unsaturate recovery facilities are fuel gas, C_3's for poly feed, C_4's for alkylation feed, plus a net make or n-butane for gasoline blending. The recovery system pulls out 80% of the C_3's, 99% of the C_4's and rejects all but 2.7% of C_2-plus.

The Magnolia olefin-recovery unit operates at a 400-psig. absorption level to recover 99.9% butylenes and 90% propylenes from 24 M.M.s.c.f.d. of refinery production gas and 14,500 bbl. per day of refinery absorption gasoline. The propylene-rich and butylene-rich streams off the unit are then directed to alkylation plants. A small part of the butylene stream is used in the propylene alkylation feed charge.

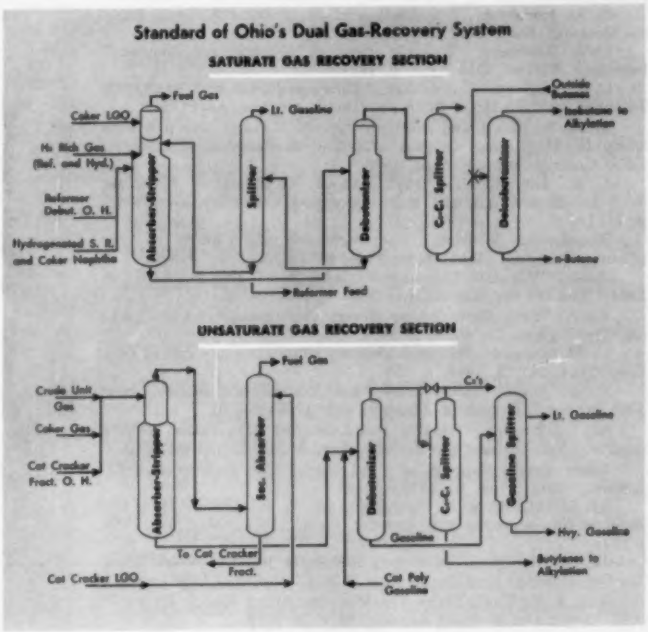


Fig. 1.

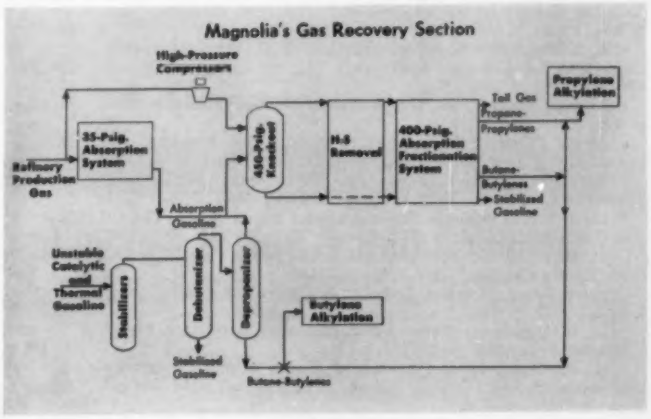


Fig. 2.

GASOLINE

Its Processing
Its Problems

Selected references on GASOLINE

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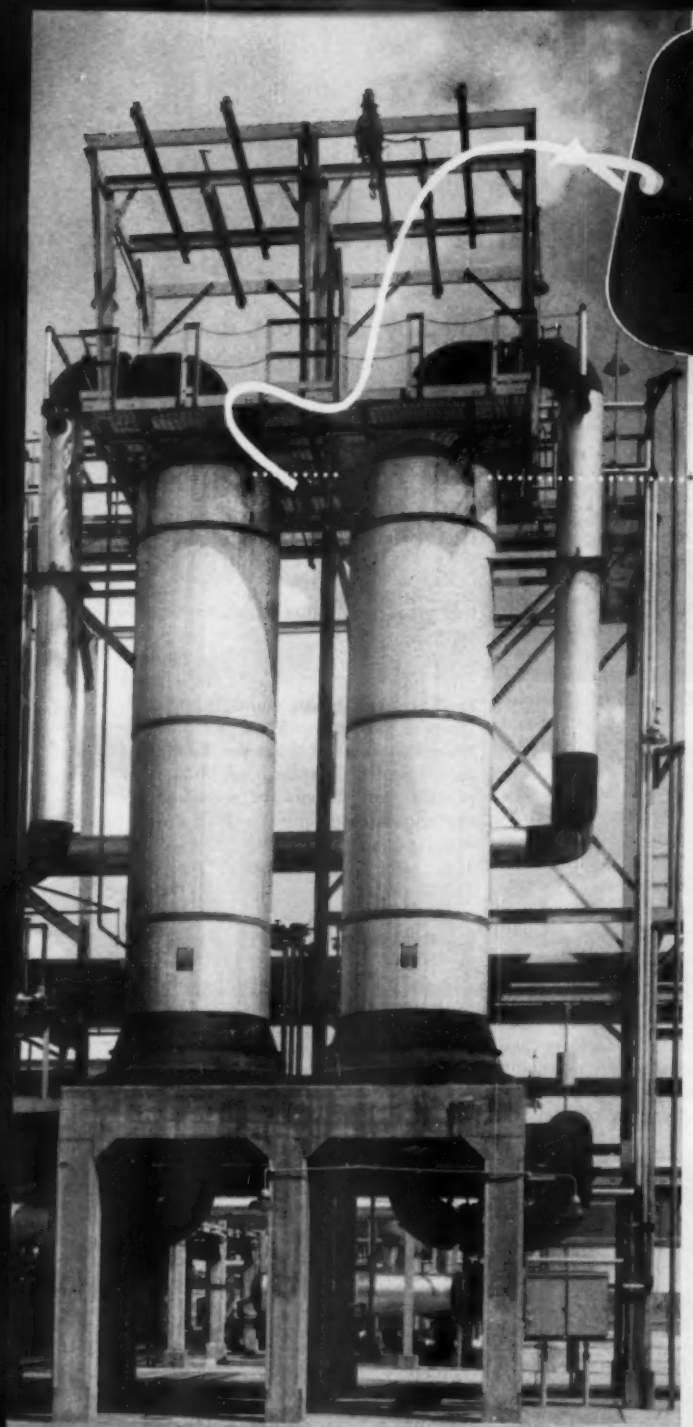

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SPECIFICATIONS:

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SIZE: 5-ft. 6-in. diameter by 30-ft. high
DESIGN PRESSURE: 700 pounds per square inch
DESIGN METAL TEMP: 985° F
PLATE THICKNESS: 3⅛-in. shell
CATALYST USED: Metallic platinum, finely dispersed
CONTROL: Temp. & Pressure: Very CRITICAL
PRODUCT IN: Low Octane gasoline
PRODUCT OUT: High Octane gasoline

FABRICATING CONTROLS USED

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PIPELINES

Pipeline reduces capital investment

. . . by using a combination of small pipe, thin walls, and high operating pressures to obtain equal throughput capacities.

BY W. P. ANSLEY
Assistant superintendent, Supply and Transportation Department, Shamrock Oil & Gas Corp.

CONSTRUCTION of a 296.7-mile, 6-in. pipeline extending from Amarillo, Tex., to Albuquerque, N. M., has recently been completed by Shamrock Oil & Gas Corp.

The pipeline is jointly owned by Texas Pipe Line Co. and a Shamrock affiliate, West Emerald Pipe Line Corp. The line was built to transport refined products from Amarillo to tank terminals located at Tucumcari and Albuquerque. All phases of design, surveying, purchases of rights-of-way and materials, and actual construction were either performed or supervised by Shamrock personnel.

Design . . . In designing the facilities required, Shamrock took advantage of previous experience in the construction and operation of products pipelines. This showed that the combination of small pipe and relatively high pipeline pressures offers equal throughput capacities with considerably less capital expenditure than large pipe combined with low pipeline pressures.

As a result of this knowledge it was decided to construct the line out of 6-in. pipe with pumping stations capable of putting up 1,500 psi. to be located at Amarillo, Tucumcari, and Dahlia, N. M. These facilities give a gasoline capacity of 12,500 bbl. per day from Amarillo to Tucumcari, and 10,500 bbl. per day from Tucumcari to Albuquerque. These capacities may be increased by adding additional pumping stations at selected points along the pipeline.

Another substantial savings in cost was obtained by using lightweight (0.188-in.-wall) high-pressure pipe. The pipe used was API 5LX X-42 electric-weld pipe. Use of this lightweight pipe not only afforded savings in pipe cost, but also resulted in lower freight, handling, and welding costs. Shamrock's experience over a 5-year period in operating pipelines constructed of similar pipe at pressures up to 1,500 psi. has been very satisfactory, and resulted in the decision to use lightweight pipe in this pipeline.

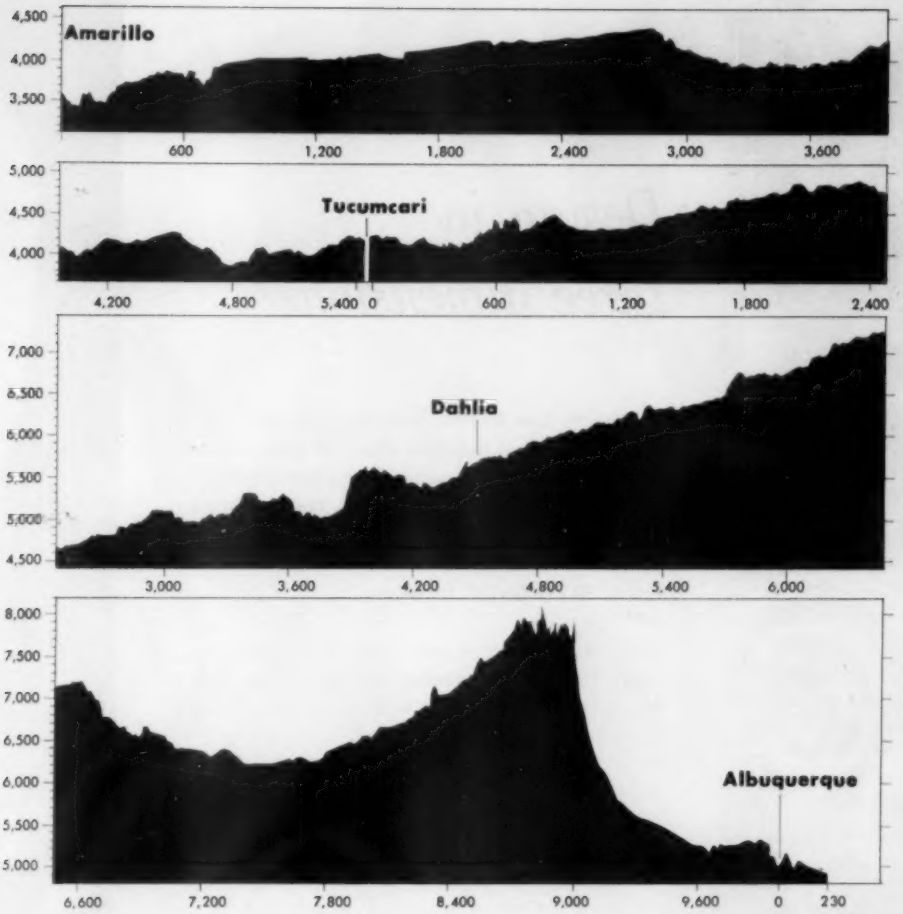
Credit for the savings realized on this project by using small, high-pressure, lightweight pipe must be given to the steel industry for developing line pipe with relatively thin wall thickness capable of withstanding high internal pressures. Prior to this development the throughput capacities existing in the Amarillo-Albuquerque pipeline could only be obtained by the use of large pipe with low operating pressures, or very heavy small pipe with higher operating pressures. Either is extremely costly under today's price structures.

ROCKY TERRAIN in Sandia Mountains required frequent use of dynamite, for which holes are being drilled here.

Corrosion protection essential . . . In Shamrock's opinion, the use of thin-wall pipe makes the application of an excellent protective pipe coating to be followed by cathodic protection not only desirable but imperative. Loss of only a small portion of the thin sidewall to either internal or external corrosion causes a decided weakening in the pipe's strength. As a result, it forces reduced operating pressures and loss of throughput capacity.

Coating specifications on this project called for a primer coat to be followed by a 3/32-in. minimum thickness application of coal-tar enamel, and for the most part 15-lb. felt reinforced with glass-fiber strands. Although cathodic-protection equipment has not been installed as yet, a preliminary survey indicates that adequate protection may be obtained with eight rectifiers placed at locations along the pipeline convenient to electrical supply outlets.

Stations remote controlled . . . The Amarillo-to-Albuquerque pipeline operates in conjunction with a similar pipeline from Amarillo to Lubbock, Tex., with pumping stations for both pipelines located at Shamrock's Amarillo products terminal. The Amarillo terminal serves as a nerve center for



PROFILE shows elevation change from 3,500 ft. at Amarillo to some 8,000 ft. in mountains east of Albuquerque.

PIPE GANG works through terrain typical of 16-mile stretch in Sandia Mountains.

both systems with dispatchers and pumpers on duty around the clock.

For this reason the Tucumcari and Dahlia pump stations were designed for unattended operation with control of the stations to be accomplished at Amarillo through telemetering equipment. All three of the pump stations are equipped with two centrifugal pumps each. Drivers for the Amarillo station are electric motors, Tucumcari has dual-fuel diesel engines now operating on natural gas and diesel fuel, and Dahlia is equipped with diesel-fuel engines.

The Amarillo station has two 200-hp. units, Tucumcari two 310-hp. units, and Dahlia two 310-hp. units. The Amarillo motors drive 4 by 4 by 8¾ pumps which operate 3,560 r.p.m. and develop 1,500 psi. in five stages. The engines drive pumps of the same size at 3,430 r.p.m. and boost product from 50 to 1,500 psi. at Tucumcari and 50 to 1,400 psi. at Dahlia in eight stages.

Construction . . . For the most part construction of the pipeline was of routine nature with very good terrain from Amarillo to Tucumcari (103.2 miles) giving away to rocky rolling hills from Tucumcari to Chilili (155.8 miles). At Chilili the pipeline entered the rugged Sandia Mountains where heavy brush, steep mountain slopes, and granite rock made pipelining slow and difficult for a distance of 16 miles.

Once through these mountains the pipeliners enjoyed downhill terrain with sandy soil the remainder of the distance to Albuquerque. Initial construction started in May 1958, with the segment from Amarillo to Tucumcari being completed and placed in operation during July. By using two pipeline contractors the segment from Tucumcari to Albuquerque was completed in record time for the terrain covered, and this portion of the line was ready for products in November.

W. E. Neill & Associates, Borger, Tex., surveyed the line. Pipeline construction contractors were Arey Pipe & Construction Co., Inc., and Groninger & King, Inc., both of Pampa, Tex., and pump stations were installed by Guy Rogers, Dumas, Tex., and Sam Robertson, Amarillo.

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FLUOR

Engineers and Constructors

Design in three dimensions

At Fluor's Los Angeles headquarters, there is an 8,000-square-foot building where 30 plant designers work with 20 professional modelmakers. Drafting tables are within 10 feet of model assembly tables. Another building contains an elaborate photographic studio where precisely scaled isometric and plan views can be taken under shadowless lighting.

All this began seven years ago when Fluor engineers built a scale model and rigged miniature hoists to solve a difficult erection problem. Success of this trial led to experiments with the use of models as a basic design tool. Cost studies showed substantial savings in drafting man-hours (net savings, above modelmaking costs.)

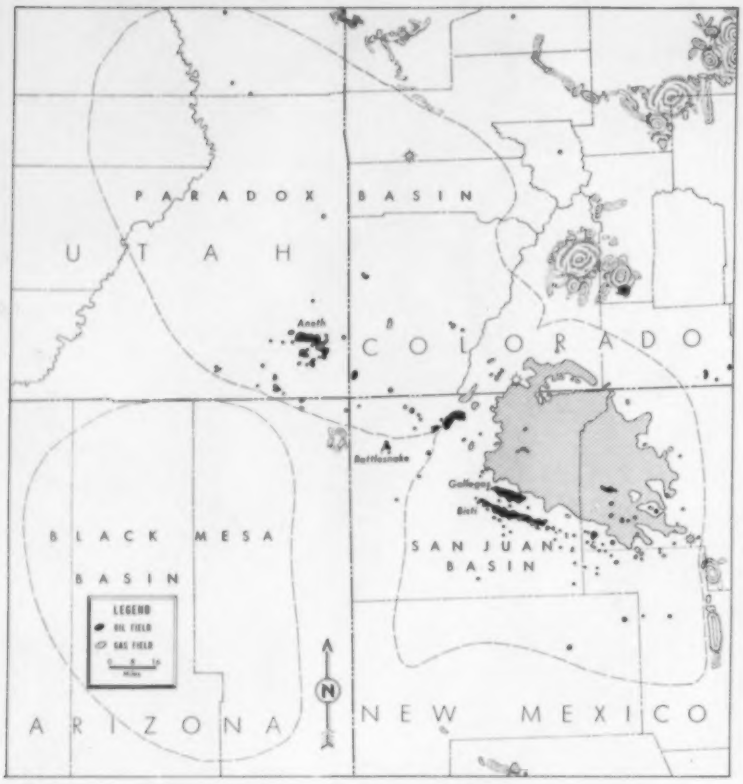
Today, models are to be found in most of Fluor's drafting rooms, and nearly all Fluor-built plants are designed with the aid of this tool. Beyond the dollar savings there are many less tangible benefits. Sizable groups can confer over a model, reach quick agreement on layouts, approve or revise many details at a single session.

Piping runs are shorter and more direct, valves and instruments are more accessible when designers lay them out on a model (a Fluor comparison study of a refinery design showed a $50,000 saving in pipe, fittings and fabrication by use of a model vs. conventional layout drawings.)

Costly revisions are minimized when many specialists can study a complete plant in miniature before construction begins. In the field, models serve as a reference for construction crews and a guide for operator training.

Unless scale models are properly used—as a basic, integrated design tool—most of these advantages are lost. The development and refinement by Fluor of design techniques using scale models has been a creative contribution to the engineering and construction industry.

For more information on the use of scale models in design and construction, write to Dept. 33, The Fluor Corporation, Ltd., 2500 South Atlantic Boulevard, Los Angeles 22, California.



Where these four states meet . . .

- *Transportation is expensive*
- *Tool-joint wear is high*
- *Water is excessively hard*
- *Personnel turnover is intense, but*

Drillers are licking the Four Corners problem

BY MARVIN PARKER
Great Western Drilling Co., Midland, Tex.

DRILLING EXPERIENCE in the Four Corners has shown that:

• Four Corners has grown into a major area of drilling in the past 2 years. Drilling practices are being improved with better drilling fluids, better methods of controlling water flows, higher rotary speeds in softer formations, and more bit weight while drilling the harder formations. Use of gas in the San Juan basin has proved to be the most economical method of drilling when formation water is not encountered.

• Maintenance of surface equipment is much the same as other areas except for the effect of very hard water containing fine solids in suspension.

• Drill-string maintenance is more critical because tool-joint wear is increased while gas drilling.

• Transportation of equipment is expensive during normal operating conditions but is increased during bad weather.

• Long drives, rough roads, bad weather, and high living costs are reasons for an above-normal personnel turnover. Examination of records and personal contact with field operations makes it conclusive that many drilling problems in the area are man-made.

The average rotary rig operating in the San Juan basin is in the 500-hp. class, with triple masts and 14-in., 250-hp. to 16-in., 500-hp. slush pumps. Since a large percentage of the gas wells are drilled in with gas, use of gas drilling engines is more popular and less expensive than diesel engines. Some contractors have adopted the policy of changing the gas drilling engines to diesel engines when natural gas is not available. This results in a saving of approximately $35 per day over using LPG fuel.

Blowout-preventer requirements usually consist of a double hydraulic unit with the control panel set approximately 75 ft. from the rig. A rotating head is standard equipment when drilling with gas. The use of steel mud tanks is considered necessary by most operators and contractors to insure proper drilling-fluid control.

. . . Blanco field has production from the Pictured Cliffs and Mesa Verde formations. The following practices and problems are those primarily of drilling Mesa Verde wells: The surface is usually drilled with a 15-in. retip bit and 10¾-in. casing set at about 175 ft. Drilling of 15-in. holes for 10¾-in. casing has eliminated the problem of getting the casing down. In the past when 13¾-in. holes were drilled, it was necessary to ream the hole from one to three times.

Boulders cause trouble . . . One surface problem along the San Juan River and in the northern and northwest section of the Blanco field is drilling through river boulders. These boulders are igneous rocks that have been washed down out of the mountains and deposited in old stream beds. This section can usually be drilled; however, it takes considerably more time and bits than normal. After the hole is drilled and the bit is pulled more boulders fall in and the casing will not go to bottom. The use of cement and lime to gel the mud results in 300-seconds or-higher viscosity and has proved to be the best way to drill these boulders. Some surface holes have had to be cemented more than once to facilitate drilling and a few

Refinery licks tough heat exchanger crisis with emergency tube service

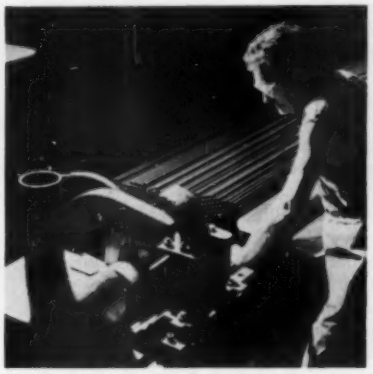
A sudden tube failure at the Pure Oil Company's Refinery in Lemont, Illinois, recently put Bridgeport's condenser tube service to the test. The failure hit on Friday afternoon—just before business slowed down for the week end. Faced with the prospect of costly equipment down time, the refinery called Bridgeport's Chicago office to find out how fast new tubes could be supplied. Here's a round-the-clock story of how the emergency was licked.

Friday, 2:30 P.M.: Salesman from Bridgeport's Chicago office learns that Pure Oil needs 900 Admiralty condenser tubes, and fast.

Friday, 3:00 P.M.: Salesman contacts our Bridgeport, Connecticut, mill and is informed that order can be delivered to Pure Oil Refinery in one week.

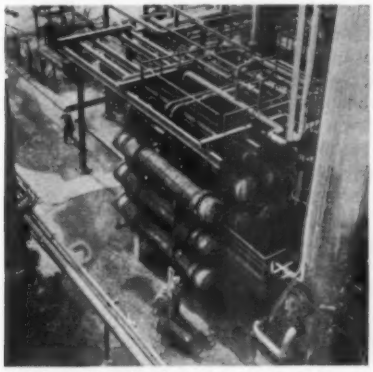
Friday, 3:30 P.M.: Sudden change in customer's needs makes immediate delivery of tubes imperative.

Friday, 4:15 P.M.: Chicago office checks through coast to coast network of Bridgeport warehouse stocks. Locates tubes at Beaumont, Texas.



Friday, 4:30 P.M.: Special night shift at Beaumont is put on job to cut tubes to special lengths and pack for shipment.

Saturday, 4:00 A.M.: Special truck leaves Beaumont, Texas, with order for Pure Oil Refinery in Lemont, Illinois.



Sunday, 11:30 P.M.: Truck arrives at Lemont Refinery with 900 Admiralty tubes, ready for repair work to start Monday morning.

While emergencies like this don't happen every day, they do prove dramatically that Bridgeport's customer service can come to the rescue. When we talk about fast service from our network of sales offices and warehouses, we mean it. Let us tell you more about our service on your condenser and heat exchanger tube needs, whether they're emergencies or normal deliveries. Call your nearest Bridgeport Sales Office, or get in touch with us direct.

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cases have been so severe that the surface hole was lost.

After surface casing is cemented and set 24 hours, the 9⅞-in. hole is started with a soft-formation bit using 7-in. or 8-in. drill collars and 4½-in. drill pipe. The formations drilled down to approximately 3,500 ft. are soft sands and shales, and this interval is usually drilled in 8 to 10 days with 6 to 10 bits. The use of 9⅞-in. bits rather than 9⅝-in. has reduced the danger of twisting off the bit pin, since the 9⅞-in. bit has a 6⅝-in. API regular pin and the 9⅝-in. bit has a 4½-in. API regular pin.

An increased penetration rate has been accomplished by using jet bits to around 3,000 ft. when the horsepower available is sufficient to jet drill. A rotary speed of 90 to 120 r.p.m with 40,000 to 50,000 lb. of weight on the bit is a good combination down to approximately 3,000 ft., then about 70 to 80 r.p.m. with 60,000 lb. is better down to approximately 3,500 ft.

There is very little crooked-hole trouble while drilling this intermediate section, but some moderate lost-circulation problems exist at or near the casing depth. Circulation can usually be regained and maintained with the addition of some basic lost-circulation material. It has been a common practice to drill with water down to 1,500 to 2,000 ft., then mud up with a fresh-water gel chemical mud. When drilling with water, it is necessary to keep mud tanks clean and have clear water at the pump suction.

Water that is jetted into the reserve pit is pumped back into the system after the solids have settled. This practice results in a water saving. It is possible to go deeper with water but the chance of sticking the pipe is increased. After mudding up, the solids buildup is still a problem and will result in stuck pipe if the mud system is not kept clean.

The 7⅝-in. casing is set through the Pictured Cliffs formation, which is enough to shut off all water zones. The gas wells are then drilled to around 5,500 to 6,000 ft. with gas. The average amount of gas required is 2½ M.M.c.f.d., but some wells have been drilled with less when no water was encountered. Gas is piped to the location through 2-in. line pipe at from 400 to 600-psi. pressure, and it is then heated to remove any moisture. The normal standpipe pressure is 150 to 200 psi. while circulating. The average drilling time with gas is from 4 to 6 days, 50 to 60 rotating hours, and using four to six 6¾-in. rock bits. When this same interval is drilled with mud it requires 10 to 12 days, and 13 to 15 bits.

The drill string consists of 3½-in. drill pipe and 5-in. to 5½-in. drill collars. The rotary speed is 60 to 70 r.p.m., with 15,000 to 25,000 lb. of weight on the bit. Hard-formation bits are used to drill the entire section.

Penetration rate is not increased by using softer-formation bits and the gage wear determines the bit life. Gas drilling is a simple and economical method of drilling when no water zones are drilled. But when water is encountered and the well stops "dusting," the drill string can be stuck very easily. The dry cutting coming off bottom after drilling a wet zone will stick and ball at the moisture zone. When the bit is pulled up into this zone a stuck drill string will result.

One method of cleaning the hole of these wet cuttings is to close the pipe rams, pressure up the system, and release the rams. This tends to purge the hole and remove the balled cuttings. This method has proved a fire hazard, especially when drilling wet cement. The balled cuttings can be blown into the rotating head, opening it on one side, and result in gas leakage under the rig floor.

... **Near Bondad, Colo.,** and Cedar Hill, N. M., on the edge of the basin where the dip of the formations increase, there is a critical crooked-hole section. A few wells in this area have exceeded 20° vertical deviation. But by using a bottom-hole reamer, large drill collars on bottom, and a stabilizer, the rate of increase and total deviation can usually be controlled and held within contract limits.

... **The Glades,** near Aztec, N. M., is the only area where it is not possible to drill with gas through the Mancos shale section. The amount of water encountered makes it impossible to gas-drill. Therefore, 7-in. casing is set around 4,500 ft. and the pay is drilled with gas to around 4,900 ft. The upper Mesa Verde formation in this area is a sharp sand, and bottom-hole reamers are needed to keep the hole in gage.

... **Jicarilla field** is much the same as Blanco and Governador fields, except that a bentonitic shale section near the surface requires a good mud to prevent sticking the drill string. Most operators are now using a low-solids oil-emulsion mud which has eliminated stuck pipe and the difficulty of running logs. A few wells have been drilled with mud all the way and the greatest problem is a lost-circulation zone on top of the pay.

... **Bisti field** is being drilled by somewhat smaller rigs than in other parts of the basin. The equipment required is about the same except that no gas-drilling is being done. There are no crooked-hole or blowout problems, but drilled solids build up the mud weight. The use of desander units has become common because excessive mud weights tend to mud off the pay zone.

The formations drilled are soft to medium-hard requiring 10 to 12 days, 150 to 175 rotating hours, and 12 to 14 bits. A rotary speed of 100 to 120 r.p.m. with 25,000 to 35,000 lb. of weight on the bit is effective down to 4,000 ft., then about 75 to 85 r.p.m. with 30,000 to 40,000 lb. of weight to total depth. In a typical well, 8⅝-in. casing is cemented at 250 ft. and 5½-in. casing at 5,000 ft.

Paradox basin . . . There are a number of different fields in the Paradox basin, but Aneth field is more widely known and has been adopted by most as the name for the entire area of present production. Production is from the Paradox member of the Hermosa limestone of Pennsylvanian age. The overlying formations consist of sandstone, shale, conglomerates, and limestone.

The rotary rigs operating in the Aneth area are of the same size and horsepower class as the rigs in San Juan basin. The standard blowout-preventer hookup is usually a double hydraulic unit. But on wildcats, Hydril blowout preventer, hydraulic valves, and chokes have been requested. The drill strings consist of 4½-in. drill pipe, 6-in. to 7-in. drill collars in 8¾-in. and 9-in. holes.

Average drilling time in the Aneth area ranges from 23 to 27 days. Rotating hours amount to from 300 to 350, with bit consumption of from 27 to 33. Common bit weights range from 40,000 to 60,000 lb. Rotary speeds of 100 to 120 r.p.m., bit weights of 40,000 to 50,000 lb., and jet bits are more effective down to approximately 4,000 ft., then more weight is needed for a good rate of penetration. It is not good practice to drill below 2,000 ft. with water because of unconsolidated water sands that will stick the drill string. A low-solids high-pH oil-emulsion mud has proved to be a good drilling fluid for both the operator and contractor. A 5-cc.-or-below water loss is desirable before drilling into the pay.

The drilling problem most likely to prove troublesome in the Aneth field is the water flows, and there has been no way to predict where they will occur. The depth at which the flows have been encountered ranges from 440 ft. to 3,530 ft. The formations from which they can be expected are: Morrison group, San Rafael group, Glen Canyon group, Chinle and Shina-

Preparing for a tie-in on one of two expansion projects begun in 1958 for Transcontinental Gas Pipe Line Corp.

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rump. The water flows vary from a small stream up to 6-in. flows. The flows do not present a drilling problem so much as a surface hazard. A conductor pipe, usually 60 ft., is cemented and sometimes a blowout preventer is used to control the water.

Most of the time the water can be piped or ditched off without danger of washing out the location pad. Since the surface casing is set around 1 000 to 1,800 ft. there is usually no hole trouble, but getting a good cement job is difficult without squeezing. Some operators are using weighted muds as high as 15 lb. per gal. to control the flows, and are therefore able to get better cement jobs.

The problem of drilling boulders on the surface is not as servere as in the San Juan basin but these are quite troublesome at times.

Water . . . The availability and securing of water is a common problem throughout the Four Corners area. The operator usually pays for the water but the contractor is responsible for laying lines, installing water pumps, and pumping the water. Recently, the contractors have been required to furnish the water in one area. The water can be pumped to some locations but the distance involved prohibits pumping to others. During the winter months, pumping water is almost impossible, because of the prevailing below-freezing temperatures. The cost of hauling water has been as much as $2.50 per foot of hole in a few cases. The water available in the Four Corners comes from the river, small streams, sumps in the dry washes, and a few scattered water wells. Some operators in Aneth field are drilling water wells and using the water flows to a good advantage.

Transportation . . . The cost of transportation varies over a wide range. The rugged terrain, remote locations, and inadequate number of trucks increase moving expense. Rig moves are often complicated by regulations and trucking permits involving four states in the area. This situation often forces the contractor to use trucks not made for oil-field service. Lack of proper equipment on some trucks and inefficient horsepower to pull grades adds to moving time. On an hourly rate field move this can prove disastrous to the contractor. Inadequate trucks cause expensive delays in moving. Often delays of 2 to 4 days are experienced waiting on trucks.

The largest single cause of high transportation costs is the weather. Rigs drilling 5,000 to 6,000-ft. wells can easily have moving costs of $2 per foot of hole drilled if bad weather catches them while moving. Roads are generally good in dry weather except the sandy dry washes. During wet weather these washes are dangerous to cross because of the quicksand. Bad weather and rough terrain reflect in the operating cost of supervisor transportation. The operating cost of an automobile in the Four Corners area is 5.5 cents per mile compared to 3.2 cents per mile in the Permian basin.

"The general difficulty of keeping crews is reflected in excessive turnover, high accident ratios, increased maintenance costs, and higher frequency of fishing jobs."

Maintenance . . . The available water in this area has from 20 to 60 grains of hardness and often has fine solids in solution. The use of water filters and a water-softening corrosion-inhibitor powder is necessary to prevent damage to the cooling system of engines. The use of pressure radiator caps on the drilling engines has cut water consumption, decreased scale deposits, and reduced pitting of the liners. This is the result of a decreased amount of oxygen that can get into the cooling system. The solids in the water makes it necessary to haul clear water and have a separate water system for the hydromatic brake. The abrasives accelerate the hydromatic-brake wear and some have operated only 2 months before failure.

The maintenance of the drill string is an important and expensive item in the Four Corners area. However, drill collars give normal service compared to other areas. The outside-diameter wear is not excessive and the need of hard-metal bands is questionable. Two strings of 7-in. drill collars were run 3 years without a hard-metal band and the outside diameter was worn to 6¾-in. Another string of 7-in. drill collars was hard-banded after 1 year of service and again after 2 years of service, and the outside diameter was down to 6⅝-in. The use of a relief groove in the box and on the pin of drill collars has reduced connection failures. This relief groove keeps the stresses in the connection from being concentrated at one point and substantially eliminates failures in the box.

The use of hard-metal bands on tool joints is necessary to insure that tool joints will last as long as drill pipe. The body wear of the pipe is not critical except when the drill pipe is run in compression rather than in tension. The tool-joint wear while gas drilling is rapid because of the high annular velocity of gas laden with fine abrasive cuttings. When square-shoulder tool joints are used the effect is to round the shoulder.

Eighteen-degree "bottleneck" tool joints are undercut with gas and, in time, a square shoulder is formed where the tool joint starts to taper. Some strings have been run so long that bottleneck tool joints look like square-shoulder joints. Eighteen-degree taper tool joints are the most popular because of the reduced wear of the rotating-head rubbers and the cutting action is less.

The use of tungsten carbide hard-metal bands increases the cutting action rather than reducing it. This is caused by the removal of the softer binding metal in between the tungsten carbide particles. These particles are broken off while the pipe is rotated.

The only type of hard-metal band that has proved effective is a hard, homogeneous smooth band. At present there is no good inexpensive field method of building up these gas-cut joints. The pipe has to be hauled to a machine shop, built up, machined down, and returned to the location. The cost for this is from 40 to 50% of the new tool-joint price.

Personnel . . . It is generally conceded that a crew working together in rhythm is a safe, efficient, and productive crew. Such crews are less prevalant in the Four Corners than in other areas.

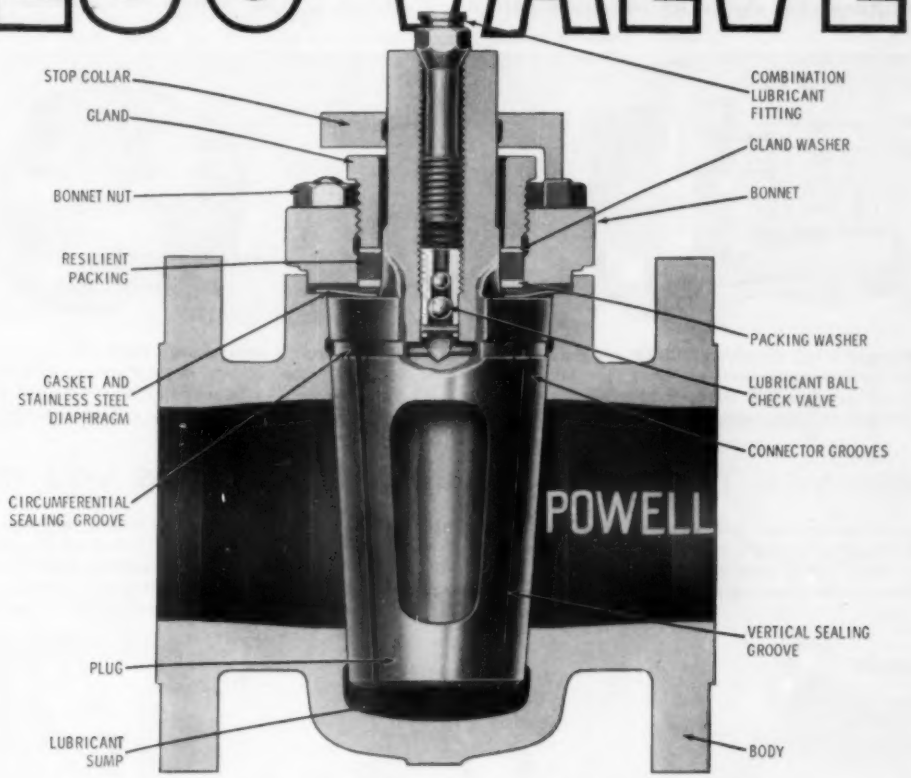
Long drives, difficult terrain, weathered roads, hard winters, and high living costs are not conducive to attracting and holding good crews. This is not meant to imply that good crews do not exist. It does mean that good crews are not abundant. If work is available in areas offering less adverse working conditions, men will naturally move to those areas. Well-established companies with long-time employes have less trouble than do some of the others. Most companies operating in this area recognize the increased financial burden on the crews and some provide off-highway transportation in extremely bad weather.

The general difficulty of keeping crews is reflected in excessive turnover, high accident ratios, increased maintenance costs, and higher frequency of fishing jobs.

This paper was presented at a meeting of the Southwestern District Division of Production, API, in Fort Worth, under the original title "Drilling Practices and Problems in the Four Corners Area."

POWELL

LUBRICATED PLUG VALVES



Sectional view Powell Screwed Gland Lubricated Plug Valve.

Like all Powell Valves, Powell Lubricated Plug Valves are superior in their field . . . and have many advantages over other conventional types of Valves.

- Simple design: only three basic parts—Body, Bonnet, Plug.
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- Machined surfaces of plug and body are not exposed in the open position. Any media adhering to the plug when in the closed position is removed when plug is rotated.
- Cavity-free straight passage assures streamlined flow in either direction. Scale and sediment cannot collect.

Powell Lubricated Plug Valves are available in sizes ½" through 16", depending on the type required—Semi-steel 175 and 200 pounds WOG;—Carbon Steel ASA 150 and 300 pounds.

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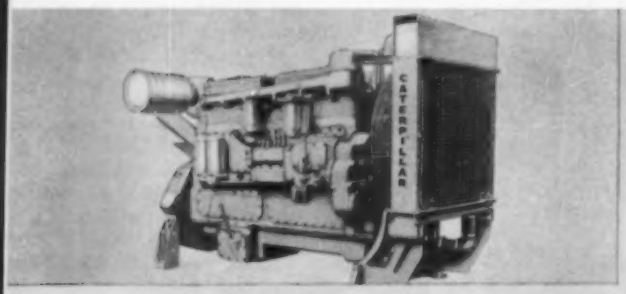
New engine output and performance for oilmen

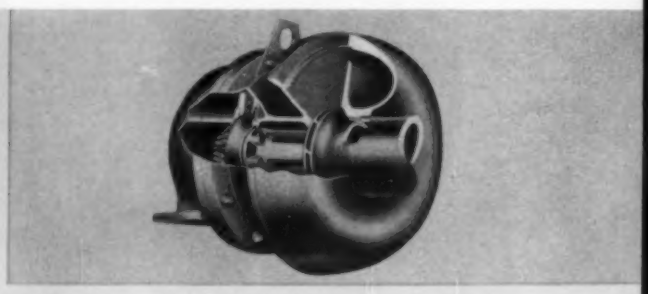
The new Cat D342 can lower your over-all costs

Whether you need prime or auxiliary power for drilling, laying pipe, pumping or powering a crew boat, the new Caterpillar D342 Diesel Engine helps cut costs and step up production. It's available in three versions —industrial, marine and electric set, both turbocharged and naturally aspirated. Ask your nearby Cat Dealer to show what it can do for you or specify its top performance on your new equipment.

Engine Division, Caterpillar Tractor Co., Peoria, Illinois, U.S.A. Caterpillar and Cat are Registered Trademarks of Caterpillar Tractor Co.



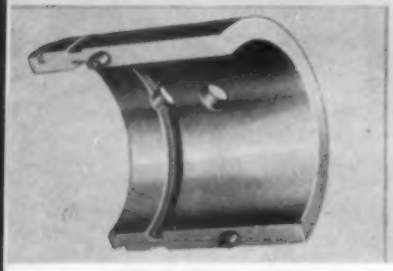
The turbocharged D342 develops 320 HP (maximum output) and 260 HP (intermittent), both at 1,300 rpm. For continuous duty it will produce 220 HP at 1,200 rpm. It measures 90 inches long, 44 inches wide and 60 inches high.



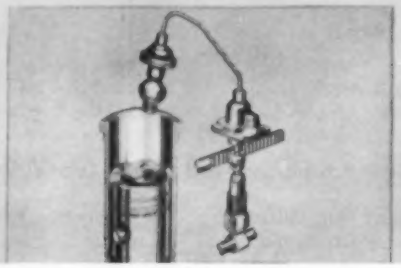
Turbocharging uses energy from the engine exhaust gases to pack more air into the cylinders. Fuel consumption per horsepower-hour is actually lowered and efficiency raised when this otherwise wasted exhaust energy is put to work.

These vital parts reduce down time, save you money

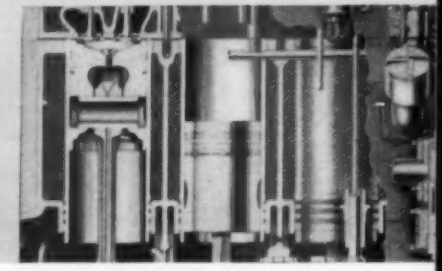
Steel-backed aluminum alloy bearings have great strength and durability. Their rapid heat dissipation means cooler running for very long life.



Fuel assembly, designed and built by Caterpillar, features individual fuel injection pumps and large, single orifice valves to prevent fouling, even when engines idle for long periods.



Full-length, wet-type cylinder liners are induction hardened. Liners are chemically treated to retain oil on liner walls. Pistons ride with minimum wear, heat is dissipated rapidly.



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Engine analyzer spots trouble in the making . . . and indicates adjustments to permit more efficient gas-engine operation

BY M. G. WALLINGTON
United Gas Pipe Line Co.

THE ELECTRONIC analyzer has been found to be an excellent maintenance tool on spark-ignited gas engines. While an engine is running, it is possible to analyze its mechanical condition.

There are three distinct tests or checks that are made using the engine analyzer. They are (1) ignition, (2) vibration, and (3) pressure.

Presented at NGAA regional meeting, January 23, Oklahoma City.

The ignition test permits the operator to observe the ignition voltage pattern on an oscilliscope screen. Timing can be checked against crank-angle position which is also presented on the screen from a pickup actuated from a preset mark on the engine flywheel.

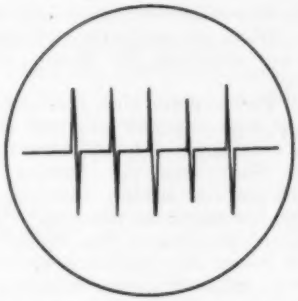
Ignition Analysis

The following ignition troubles have been detected using the engine analyzer:

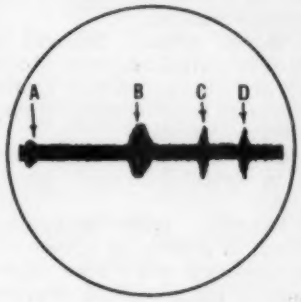
1. Timing retarded or advanced (Very critical on four-cycle engines

Engine patterns vary somewhat for different engines as to amplitude and timing, but for a specific engine, the patterns should have approximately the same configurations.

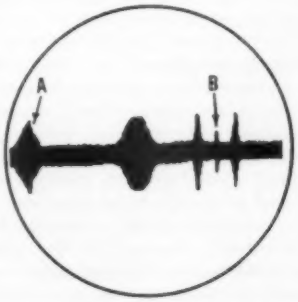
1. Typical ignition voltage pattern for a single-cylinder firing. About 35° of crankshaft rotation is shown.



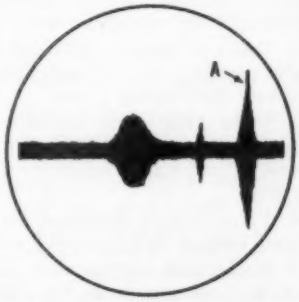
2. Typical ignition pattern for five cylinders firing off of one magneto. Ignition voltage to one of the cylinders is low, caused by a shorted secondary circuit. Shown is 360° of crankshaft rotation.



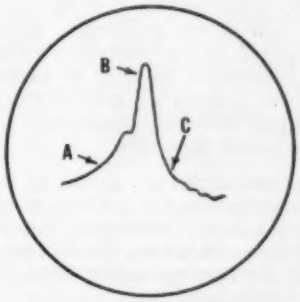
3. Normal two-cycle engine-vibration pattern. Combustion activity takes place at A, exhaust blowdown at B, injection-valve opening event at C, and injection-valve closing event at D. Shown is 360° of crankshaft rotation.



4. Abnormal two-cycle-engine vibration pattern. Detonation takes place at A, and a worn injection-valve guide is indicated by the vibration at B.



5. Abnormal vibration pattern for a two-cycle engine. The excessive amplitude of the injection-valve closing event at A indicates a hammering injection valve, caused by excessive valve-tappet clearance.



6. Normal pressure pattern. Compression takes place at A, firing at B, and scavenging at C.

with two magnetos.) Indicated by relation of horizontal position of ignition pattern to reference mark.

2. Slack in magneto drive. Indicated by horizontal movement of ignition pattern in relation to the reference mark.

Could be caused by the following: (a) Drive disk worn, (b) slack in magneto, (c) worn impulse coupling drive, (d) worn adjustable drive members, (e) worn bearings in magneto.

3. Main breaker points arcing. Indicated by variation of vertical amplitude of ignition pattern and by sharp horizontal lines within pattern showing actual arcing. Could be caused by the following: (a) Poor setting of points, (b) weak condenser, (c) bad resistor, (d) bad coil ground.

4. Open secondary. Indicated by increase in vertical amplitude and decrease of horizontal width of ignition pattern on a particular cylinder.

5. Shorted secondary. Indicated by decrease of vertical amplitude and increase of horizontal width of ignition pattern on one cylinder.

6. Open primary. Indicated by increase of vertical amplitude and decrease of horizontal width of ignition pattern on all cylinders firing off magneto being analyzed.

7. Shorted primary. Indicated by decrease of vertical amplitude and increase of horizontal width of ignition pattern of all cylinders firing off magneto being analyzed.

8. Distributor points arcing. Indicated by vertical deflecting of ignition pattern.

9. Distributor points not opening. Indicated by presence of ignition pattern occurring at a time when another cylinder is firing. Vertical amplitude of both patterns is low.

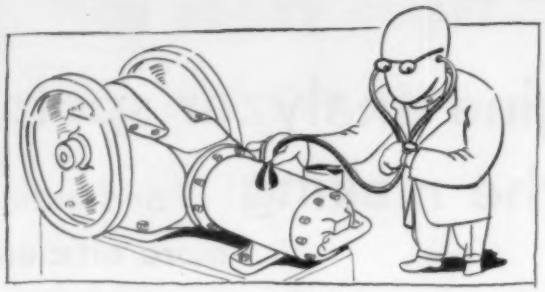
Vibration Analysis

The vibration analysis is used to observe the occurrence of events within a full cycle of a power cylinder. The vibration pickup is clamped to a nut on the cylinder, and the vibration seen on the oscilliscope can be interpreted by its amplitude, width, and crank-angle position. As slightly different patterns are seen with two-cycle and four-cycle engines, each will be discussed separately.

Two-cycle engine . . . The normal vibration pattern for a two-cycle engine shows (1) combustion activity, (2) exhaust blowdown, (3) fuel-injection valve opening, and (4) fuel-injection valve closing.

The following difficulties have been found using the vibration analysis on two-cycle engines:

1. Leaking injection valve. Indicated by vibration buildup just before valve-closing event.



"Vibration analysis is used to observe the occurrence of events within a full cycle of power cylinder."

2. Injection-valve guide worn. Indicated by distinct vibration occurring after valve-opening event.

3. Rocker-arm bushing worn. Indicated by same pattern as for worn guide.

4. Excessive valve-tappet clearance. Indicated by amplitude of valve-closing event high.

5. Detonation. Indicated by large buildup of vibration, varying in amplitude, from 5° to 15° after t.d.c. (top dead center).

6. Scored or worn ports. Indicated by wide, low-amplitude vibration. Usually occurring 50° to 60° after t.d.c.

7. Broken piston ring. Indicated by sharp, high-amplitude vibration. Usually occurring 50° to 60° after t.d.c.

8. Worn wrist pin, bushing, or connecting-rod bearing. Indicated by wide, low-amplitude vibration, occurring at b.d.c. (bottom dead center).

9. Piston slap. Indicated by wide, low-amplitude vibration occurring at 10° to 15° after t.d.c.

Four-cycle engine . . . The following difficulties have been found using the vibration analysis on four-cycle engines:

1. Excessive intake of exhaust-valve clearance. Indicated by high-amplitude vibration of valve-closing event.

2. Valve bounce. Indicated by double pattern, the second pattern following the closing event.

3. Valve guide worn. Indicated by similar double pattern except that the second pattern occurs before the closing event.

4. Valve leaking. Indicated by vibration buildup before closing event.

5. Rocker-arm bushing worn. Indicated by same pattern as for a worn guide.

6. Piston slap. Indicated by wide, low-amplitude vibration 10° to 15° after t.d.c. on power stroke.

7. Sticking piston rings. Indicated by sharp vibrations 15° to 30° after t.d.c. on power stroke, caused by blowby.

Pressure Analysis

The pressure analysis permits the operator to observe the pressure within a power cylinder throughout the complete cycle. Compression, firing, and scavenging can be observed on four-cycle and two-cycle engines; however, the analysis is somewhat different. Each type of analysis will be discussed separately.

Two-cycle engine . . . The following observations have been made on two-cycle engines:

1. Misfiring. Complete misfiring would probably be caused by a leaking injection valve. Rechecking vibration analysis should verify this.

2. Low firing pressure. Could be caused by carbon in ports, if difficulty cannot be corrected by balancing valve.

3. Detonation. Indicated by sawtooth pattern at peak of firing pattern.

4. A reference line can be superimposed on the oscilliscope for comparison of peak firing pressures of different cylinders. Balancing of firing pressures between cylinders can be accomplished more accurately and easily than using pull cards of engine indicators.

Four-cycle engine . . . The following observations have been made on four-cycle engines using the pressure analysis:

1. Low firing pressure on an individual cylinder, with perhaps occasional misfiring. Must be a mechanical difficulty. Ignition trouble would have been observed in the ignition analysis and a leaking valve would have definitely shown up in the vibration analysis. If no abnormal vibration patterns occurred, it is possible that the trouble is a worn valve guide which sometimes does not show up too well on the four-cycle-engine vibration analysis.

2. The use of the reference level enables the operator to balance between cylinder banks. Poor balance could be caused by improper mixing-valve adjustment. If two mixing valves are used, the governor linkage might require adjustment. Poor balance between banks could also be caused by poor ignition timing when two magnetos are being used. This would have been observed during the ignition analysis.

The operator using the analyzer must have a good knowledge of engine theory in order to be able to correctly interpret the various patterns seen on the oscilliscope screen, especially the vibration patterns. Also experience using the analyzer is very important. Interpretation of patterns, especially vibration, is not a cut-and-dried proposition, and a good deal of experience is required before an operator can become proficient in the use of the analyzer.

There are a few improvements which might be made in the equipment. Some trouble occurs with shorting in the cables connecting the analyzer and the various pickups. The fault, at times, is hard to locate.

A desirable feature, also, would be to have a calibrated pressure pickup which would give the operator a direct reading of cylinder firing pressure. The use of the reference line lets the operator see the relative amplitude of firing pressure but does not give an absolute value.

El Paso Natural tries out the new analyzer

In 1958 the El Paso Natural Gas Co. purchased and put into use on its Southern System, a Sperry electronic engine analyzer to further round out its preventive-maintenance program. It was believed from the outset that this instrument would prove beneficial if for no other reason than for routine engine tuneup. Since that time the firm has learned that it is also a good trouble shooter.

BY B. J. MATTHEWS
El Paso Natural Gas Co.

THE ANALYZER consists of seven basic components:

... **A cathode-ray tube** which is similar to one in your television set.

... **A pressure-rate pickup** to produce a pressure-time diagram on the screen.

... **A vibration pickup** which senses events within the cylinder and translates them to voltage patterns.

... **A synchronizing generator** which provides the signal to initiate the horizontal sweep across the screen in step with engine rotation.

... **Ignition cables** which are connected into the primary circuit of the ignition system for ignition analysis.

... **A crankshaft timing-pulse** pickup which times the analyzer to the engine.

... **A reference-level comparator** to enable the operator to compare compression and peak pressures of the various cylinders.

The analyzer is easily set up for operation due to its inherent design and compactness. The only work which is necessary on the engine is to drill a small hole in the crankshaft. This is done to provide an air gap for the timing-pulse pickup and therefore provide a signal to time the engine to the analyzer. Once this has been done on all engines, the engines need not be shutdown for an analysis. A routine check on an engine will take between 3 and 4 hours.

Presented at NGAA Regional Meeting, January 23, Oklahoma City.

Malfunctions Diagnosed

Today we have approximately 1 year of experience using one analyzer. Its greatest use has been that of a tuneup instrument. We have definitely improved the engine balance of most of the engines checked with the instrument. The troubles corrected were, of course, ignition troubles and fuel supply to the individual cylinders. This was done by the ignition analyzer and the pressure-rate pickup.

Some engine malfunctions have been diagnosed successfully:

1. In one instance a long duration cam was installed by mistake in an engine. By using the vibration analyzer and noting where the gas-injection valve closed, it was determined that the wrong cam was installed.

2. On a four-cycle engine the vibration analyzer was used to detect a worn exhaust-valve guide.

3. On numerous occasions, mistiming of the ignition systems on engines equipped with radial interruptors was detected and corrected.

4. Detonation has been detected on numerous engines by using the vibration analyzer. This detonation was not heard above the engine-room noise level.

5. Preignition was detected on one cylinder of one engine. It was found that a hot spot existed on the piston head.

These are only a few of the problems that have been found. Most of the troubles detected were in the ignition system.

Conclusions

Although our experience has been somewhat limited, it has been sufficient to draw some conclusions.

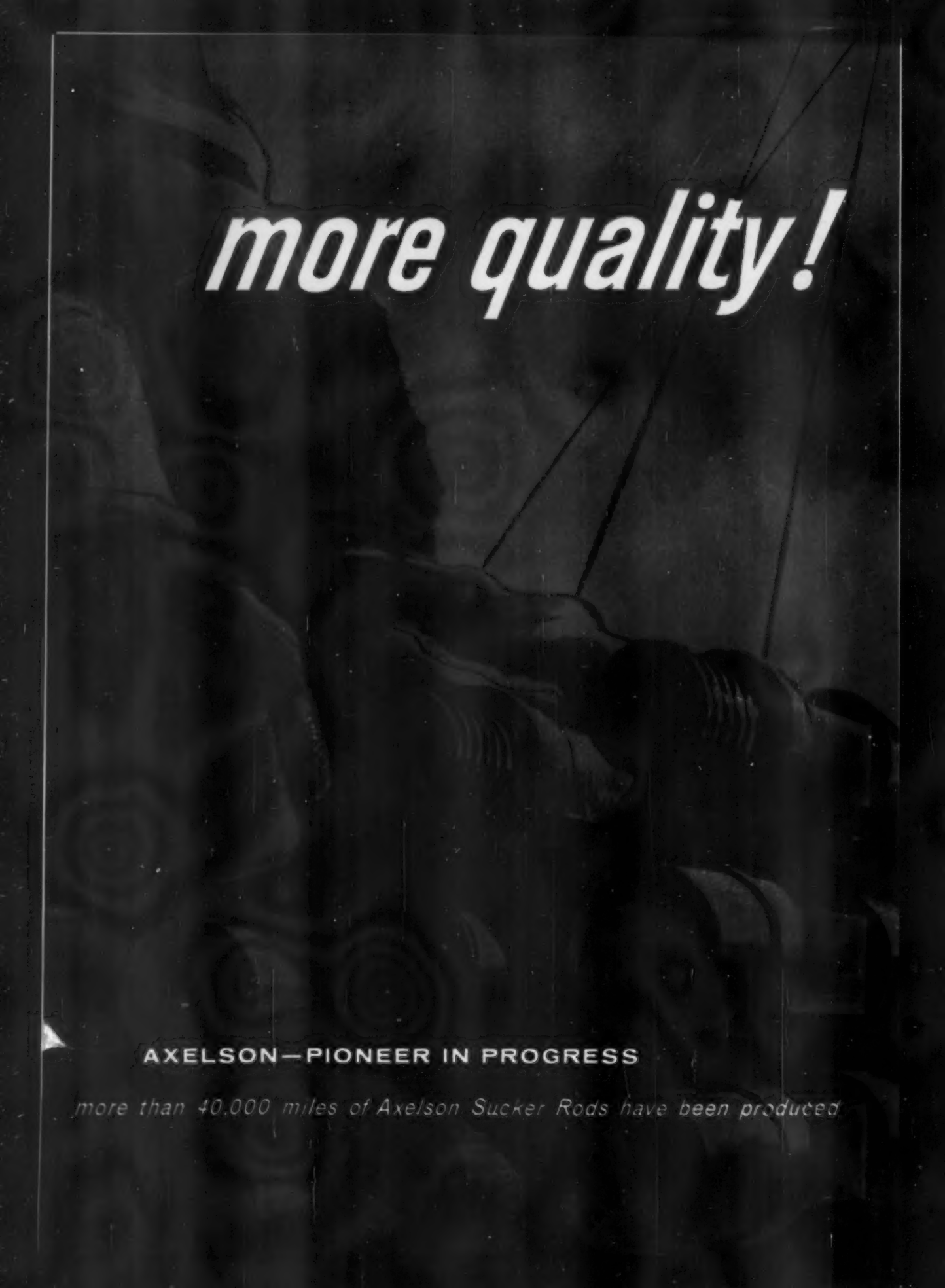
The most important immediate use of this equipment is the ignition and pressure analysis. Comparing compression and peak pressures requires little or no previous experience. Experience with the ignition analyzer can be gained rather rapidly since ignition troubles are more prevalent than any other malfunction.

In addition, it is a simple matter to purposely impose ignition troubles on an engine and observe the changing pattern. This will accelerate the operator learning process, and proficiency in ignition analysis comes about quickly.

Trouble shooting with the vibration analyzer is more difficult. Considerable time will be required before an operator gains the necessary experience to successfully pinpoint mechanical troubles. This is because mechanical troubles are less common than electrical troubles, if scheduled maintenance is in effect. This is particularly true on two-cycle engines.

From the beginning it was apparent that the value of this equipment would be realized by repeated use and experience. It is only as good as the man who is interpreting the results. On the basis of our experience we are planning to purchase an additional analyzer and train another operator.

Eventually we would like to have one available at all times in each of our mainline plants. It is our intention to use the analyzer on a routine basis rather than on a special-test basis, as has been done in the past. Only then will the instrument begin to pay dividends.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more than 40,000 miles of Axelson Sucker Rods have been produced

YOU PUMP MORE *with*
AXELSON SUCKER RODS

AXELSON NO. 77 SUCKER ROD is typical of the "quality-for-profit" features found in all Axelson equipment.

NO. 77 is the most versatile, popular, economical sucker rod available when you consider weight to strength. Applications range from very deep wells and high volume producers requiring high strength and stress range to dual and slim hole completions where strength and small diameters are required. With No. 77 you can often use a smaller diameter, lighter rod while maintaining the proper strength to meet production requirements. And, too, this weight reduction may allow a reduction in the size of the surface pumping unit.

NO. 77 is manufactured from a nickel-molybdenum alloy steel, fully normalized, tempered from end to end, and is treated to develop additional high strength for extremely heavy pumping requirements. Alloy content also aids in resistance to corrosion fatigue.

SUCKER ROD COMPARISON CHART

(ABRIDGED)

ROD TYPE		MANUFACTURER							
		AXELSON	BETHLEHEM	D & B	JONES	NATIONAL	NORRIS	OILWELL	TEXASTEEL
CARBON MANGANESE	GRADE	60	X2	#1CM	2	40	30	N	A
	YIELD	65/72	65M/72A	60/75	60/75	60/70	65/75	60/75	60/80
	TENSILE	90/105	93M/100A	90/105	90/105	90/100	95/105	90/105	90/100
1½% NICKEL	GRADE	99	46	5	7	81	40	T	NM
	YIELD	70/78	67M/75A	70/92	65/80	65/75	65/75	73/97	65/80
	TENSILE	87/95	82M/90A	88/113	85/100	85/95	82/95	85/105	85/100
HIGH STRENGTH LOW ALLOY 3½% NICKEL	GRADE	79	—	Reliance	12	92	—	W	—
	YIELD	90/98	—	95/105	95/105	90M	—	105/115	—
	TENSILE	100/108	—	115/130	110/125	115M	—	115/125	—
	GRADE	77	43	Hi-Ten	8	85	75	Y	HT
	YIELD	100/115	100M/110A	95/110	100/115	105T	105/120	95/108	110/120
	TENSILE	120/130	120M/130A	115/130	120/135	133T	125/140	105/115	125/135

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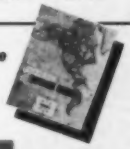

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OPERATION OF COMPUTER is simple, with all figures fed to the machine with the 10-key entry board.

PRODUCTION

New method simplifies orifice-meter-chart calculations

BY R. J. ENRIGHT
Dallas Editor

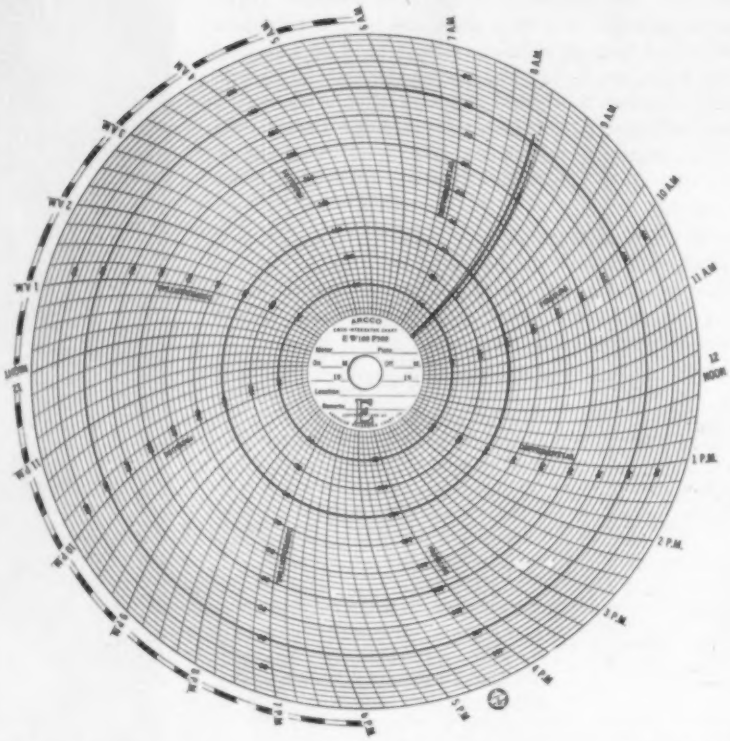
OIL AND GAS FIRMS confronted with calculating large numbers of orifice-meter charts may be missing a bet if they're still using a tedious mechanical method.

Such a chart calculation, even a complicated one, can now be whipped out, verified, and automatically printed on the back of the chart in M.c.f. together with all derivitive factors . . . all within 10 to 15 seconds.

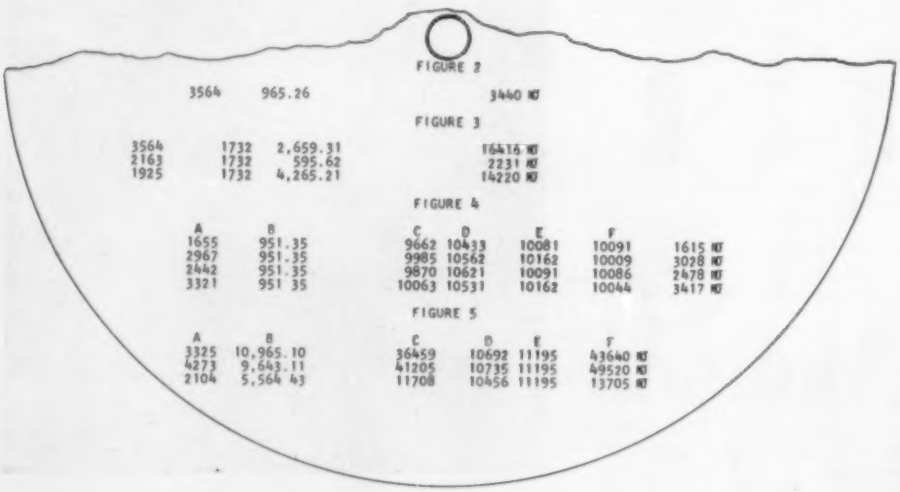
New computer . . . The key to such speed is a new electronic computing typewriter, IBM's new 632 model.

John P. Squier Co., Dallas, whose primary business is integrating and calculating orifice-meter charts, has incorporated this machine into its chart-calculating setup in what is believed to be the 632's first such application. It has found the machine to be extremely flexible and accurate as well as three to four times faster than the previous fastest method.

Basically, the 632 computer has three main components: A modified IBM electric typewriter; a standard, 10-key adding machine-type keyboard;



ORIFICE-METER CHART, above, may be integrated using new electronic computing typewriter. Fig. 1.



ALL TYPES of orifice-meter calculations are made easily and printed on the back of the chart automatically. Shown here at left are the results of four different types of calculations. Figs. 2-5.

and an electronic computing mechanism similar to the IBM 604 and containing a memory-storage section.

Computer Operation

Operation of the computer is simple, with all figures fed to the computer with the 10-key entry board. Decimal errors are eliminated since the machine automatically points off the decimal correctly after each calculation.

Fig. 2 on back of chart (Fig. 1) is a simple calculation as handled via the new method. The operator enters the integrator difference, 3564, on the small keyboard. And this figure is immediately stored in the computer. Operator then enters the combined integrator-meter coefficient 965.26 on the keyboard and presses the start bar.

This activates the computer which multiplies the two figures together, points off five decimal places (two for the coefficient and three for M.c.f.), tabs the typewriter carriage, types out the answer (3,440 M.c.f.), and returns the carriage for the start of the next calculation.

Integrator constant known . . . If a machine coefficient isn't used and only the hourly meter coefficient is known, then an integrator constant (for example, 1.732) is entered and stored by the computer. In such instances, the charts normally are grouped by differential and static ranges for convenient integration, and the integrator constant would be the same for a group of charts.

The operator enters the integrator difference (3564) on the keyboard. And the computer multiplies 3564 times 1.732 and shifts the carriage to the next position. The operator then enters the meter coefficient (2,659.31). The computer multiplies the previous product by the coefficient, types the answer in M.c.f. (16416 M.c.f.) on the chart, and returns the carriage for the next entry.

It types no intermediate results unless these are required.

Fig. 3 illustrates a second calculation in a group where coefficient and integrator difference are different but the constant is the same. In such a series, the constant is entered only for the first calculation.

Fig. 4 is a compound calculation wherein the integrator differences "A" are entered and the machine coefficient "B" is entered and stored. The computer multiplies "A" and "B," points off five decimal places, and shifts the carriage for the entry of temperature factor "C."

The product of "A" and "B" is multiplied by "C," the carriage shifts, and deviation factor "D" entered. The

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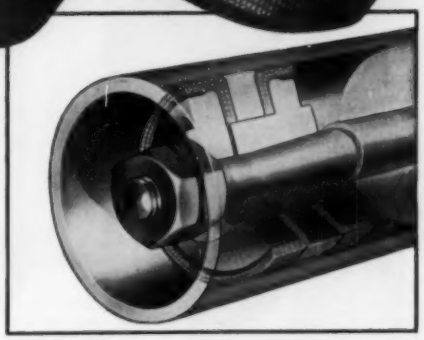

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sequence is continued with the entry of Reynolds number factor "E" and expansion factor "F." All factors and the answer in M.c.f. are printed on the chart.

This calculation indicates the flexibility of the machine since all examples involving from one to five various calculations are made without any alteration of the program.

Programing . . . Programing of various problems is handled by the machine manufacturer via a plastic tape punched to the user's specifications. This is inserted in the typewriter to coincide with specific tab stops.

All calculation examples shown so far are handled by a single program using about one-half the space available on a single tape.

In some cases, however, intermediate answers in M.c.f. may be required as shown in Fig. 5 wherein a volume is calculated under different conditions.

A second program, punched at the unused end of the same tape used for the first program, is brought into play in such cases.

In Fig. 5: "A" is the integrator difference, "B" the machine coefficient at 16.4-psia. pressure base, "C" the volume at 16.4 psia., "D" the deviation factor, "E" the conversion factor from 16.4 to 14.65 psia., and "F" the volume at 14.65 psia. corrected for deviation.

All factors in computer calculations are automatically printed on the meter chart and can be verified readily by the computer operator. Integrator differences have been printed on the chart previously by the integrator operator and totaled on an adding machine tape (OGJ, Mar. 9, 1953).

The integrator differences entered into the computer (by pressing total bar on small keyboard) are totaled and compared with the sum recorded on the tape as a final check.

Total M.c.f. for any group of processed charts may also be obtained in the same manner.

Costs cut . . . Use of the IBM 632 computer, Squier says, has substantially reduced the cost of computing orifice-meter charts.

Payout time for the computer in the particular application described in this article, he says, is less than 1 year.

Along with this, the computer may be used for billing and many other computing jobs. If desired, the typewriter can be used as a standard electric typing machine.

A card-punch attachment also is available for the 632 whereby all data can be punched into a standard IBM data-processing card as well as typed.

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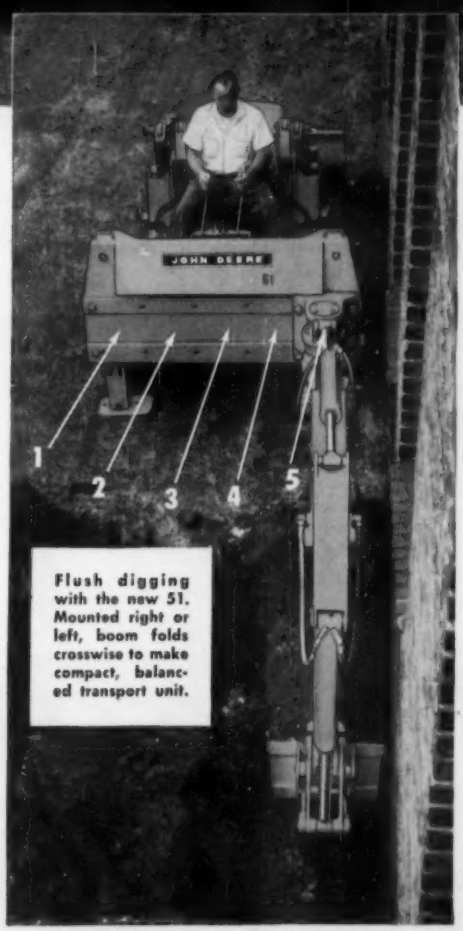
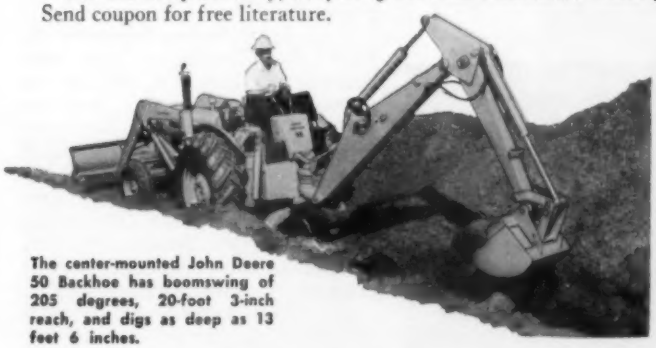


Flush digging with the new 51. Mounted right or left, boom folds crosswise to make compact, balanced transport unit.



The center-mounted John Deere 50 Backhoe has boomswing of 205 degrees, 20-foot 3-inch reach, and digs as deep as 13 feet 6 inches.

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Pipeline sup

Local water shortages are overcome by unique pipeline system. Operators are relieved of water system problems.

FIVE FIELDS in Morgan County, Colorado, are being flooded with water from the new Vaughey & Vaughey pipeline from neighboring Washington County. Designed to handle 50,000 bbl. per day, the line will eventually supply water to seven projects in five eastern Colorado townships.

History . . . The favorable water-flood potential of oil fields in the southern end of the Denver basin was realized over 3 years ago. However, the absence of adequate volumes of local water at reasonable depths precluded the planning of projects. In response to this water need, Vaughey & Vaughey initiated a water-prospecting effort. By October 1956 an adequate fresh-water reserve had been located 8 miles southeast of Brush, Colo., and 24 miles northeast of the principal oil-producing area.

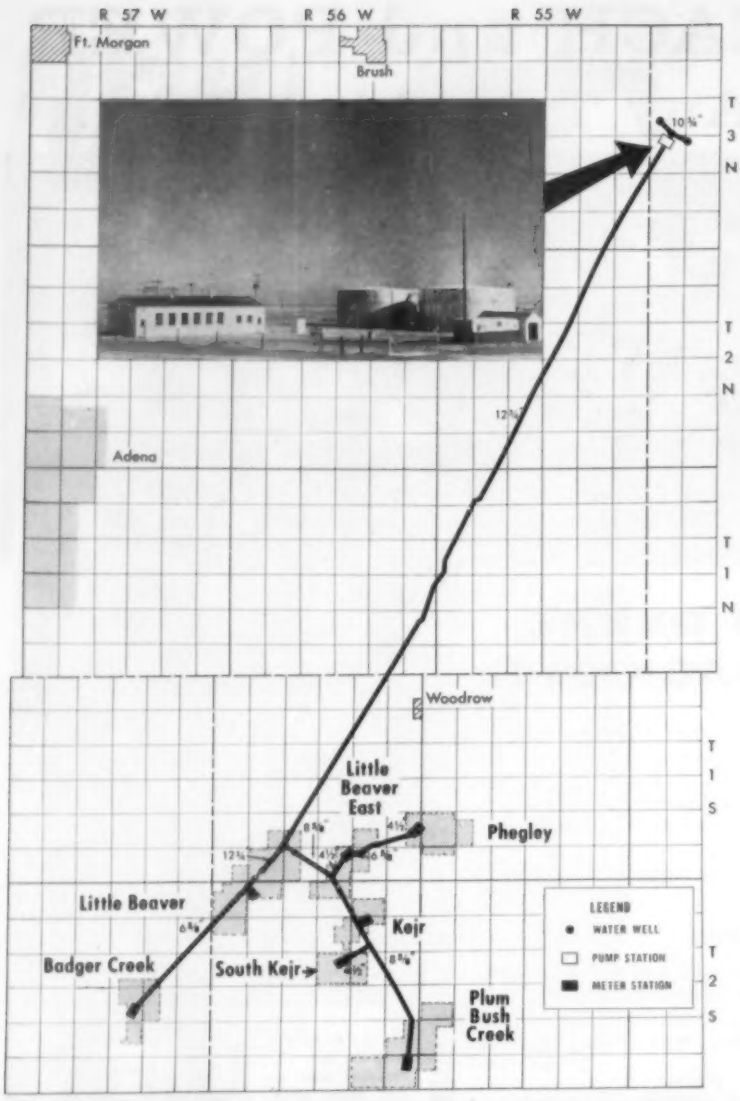
The interest and support of potential water users was immediate and almost unanimous. Therefore, a water-supply system was planned in close cooperation with the using companies which in turn began estimating their water needs and planning projects.

Construction of the water system was started June 2, 1958, and completed about September 1, 1958.

Water began flowing September 19, 1958. The Little Beaver East unit, operated by Lion Oil Division of Monsanto Chemical Co., and the Badger Creek and South Kejr unit projects operated by Sinclair Oil & Gas Co. were the first to receive water. The Little Beaver "D" unit, operated by Continental Oil Co., began taking water October 14, 1958, and Sohio Petroleum Co.'s Kejr project went on stream January 8, 1959.

At present demand, the system is supplying approximately 47,000 bbl. per day.

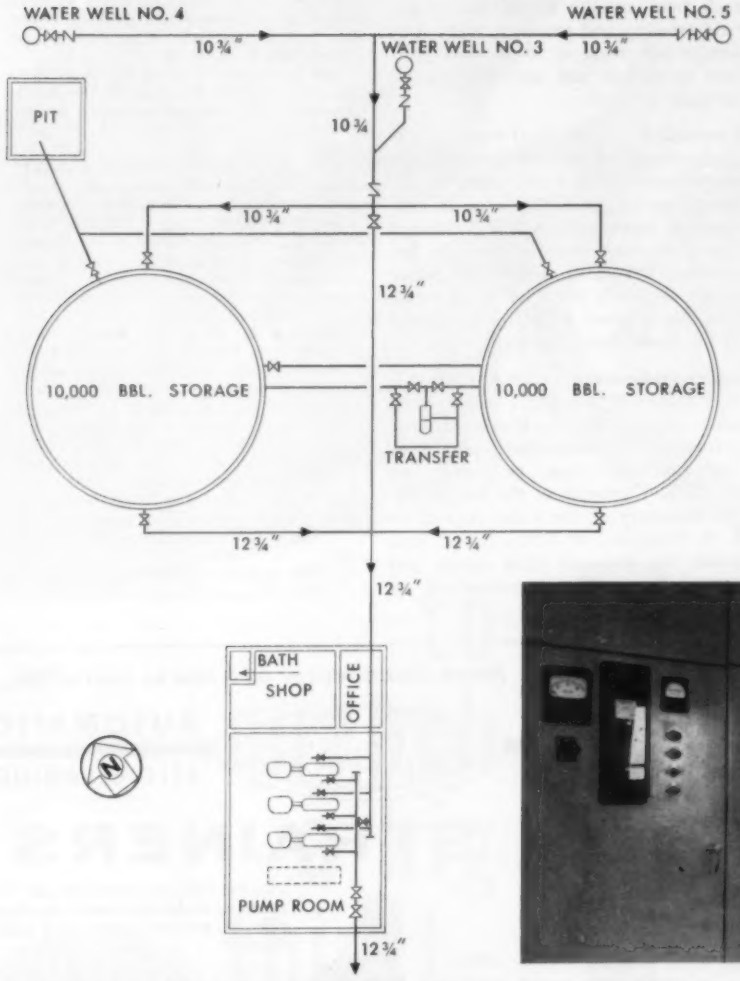
Future demand . . . Two additional projects will begin using the water on completion of facilities. These are the Plum Bush Creek unit operated by Continental, and the Phegley unit operated by Champlin Oil & Refining Co. Within the limits of the capacity of the system, it is anticipated that other major fields in the area may



Map shows location of the water line from Fort Morgan, Colo., and Adena field. The pump station, inset, is located near the water wells in Washington County. The metering station, immediately above, is one of several at the discharge points on the line.

plies water to Denver basin floods

BY ROBERT L. HOSS
Production Superintendent,
Vaughey & Vaughey, Denver

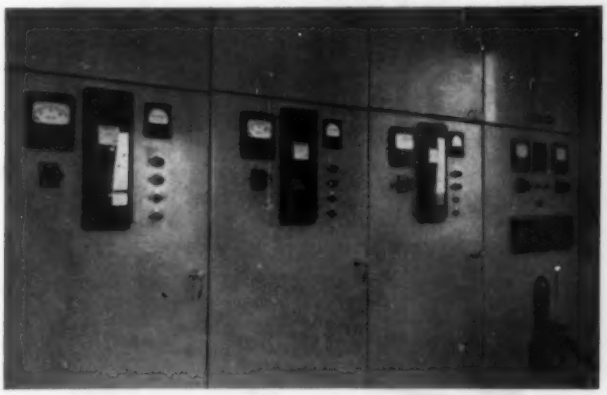


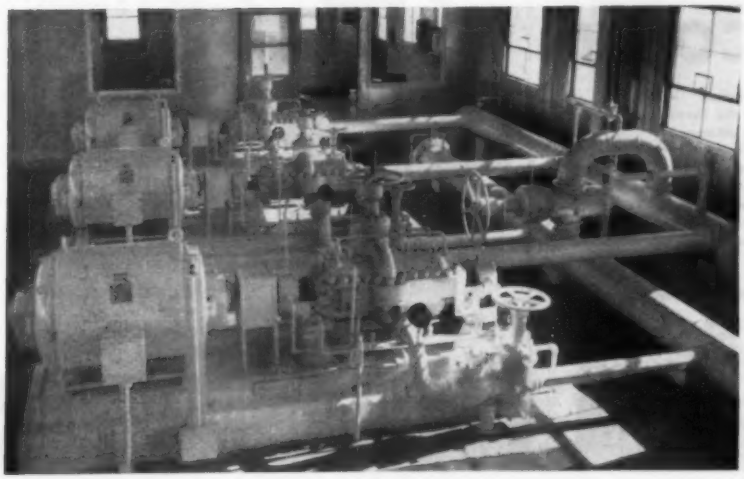
also undertake water-injection operations.

Water supply . . . The water source is a shallow alluvial deposit of sand and gravel of Pleistocene to Recent age.

Three water wells 100 ft. deep were completed on ½-mile spacing, each equipped with a 40-hp. electric motor and a centrifugal pump having a capacity of 30,000 bbl. per day. These wells deliver water to the centrally located pump station through a 10¾-in. gathering system.

Pipeline . . . The pipeline system consists of 49 miles of line varying in size from the 12¾-in. trunk to 4½-in. delivery laterals. All pipe was doped, wrapped, and buried with a minimum of 4 ft. of cover. Block valves permit isolation of the trunk line and two main branches. An elevation rise of 352 ft. must be opposed from the pump station to the southeastern end of the system.





Pump station . . . The pump station, located at the water source, consists of two 10,000-bbl. bolted tanks for surge and storage and three six-stage centrifugal pumps in parallel, each driven directly by a 250-hp., 2,400-volt, 3,600-r.p.m. electric motor. The pump-station piping layout is simple

EQUIPMENT at the pump station includes two 10,000-bbl. tanks for storage and surge removal. The pump room houses three six-stage centrifugal pumps, left, driven by 250-hp. electric motors. The controls and operating instruments are included in the electrical panel, above.

THE AUTHOR

Robert L. Hoss is a native of Tulsa. He holds a B.S. degree in petroleum engineering from University of Tulsa and an M.S. degree from University of Texas. He is now in charge of drilling and production operations in the Rocky Mountains and Canada for Vaughey & Vaughey and handles the company's recently completed water-pipeline system. Hoss was first employed by Humble Oil & Refining Co. in 1947 and worked in various engineering capacities until 1953. Then he moved to Denver as petroleum engineer in the Rocky Mountains for Midwest Oil Corp. In 1955 he accepted his present position. Hoss was 1948 recipient of Alfred Noble Prize, awarded by the Founder Societies. He helped organize the Denver Petroleum Section of the Society of Petroleum Engineers and served as the second chairman of that group.

and effective in providing adequate storage and suction head for pumps.

All water wells are remotely operated from the station, with automatic control through time clocks. Water wells and plant pumps are automatically shut down by high and low-level controls on storage tanks. The plant centrifugal pumps are protected by automatic motor-shutdown devices from operating with no line flow, excessive vibration, or packing failure.

All water is measured by conventional orifice meters at the plant suction and at each delivery point. Measurement by this method has been very satisfactory.

Water is delivered at one point in each field, usually at the site of the field treating and pumping plant. Deliveries are made at 50-psi. line pressure or higher and are delivered at constant volume.

Conclusion . . . A local water shortage existed. A remote source was found from which water could be delivered to the producing area at economical rates provided a sufficient aggregate water demand could be developed. The realization of this water supply system is the result of cooperation and support of all oil producers in the fields being served.

Acknowledgment . . . Thanks are due to Vaughey & Vaughey, and to resident partner, W. T. Blackburn, for permission to publish this report. Special mention must be made of W. D. E. Cardwell, of the USGS, for the discovery of the water source; of J. R. Wait, Jr., of Texas Brand Pipe Lines, for line and plant design and consultation during construction; of Sterling Construction Co. for line construction; and of Stearns-Roger Manufacturing Co. for plant construction.

BOOK

KNOCKING CHARACTERISTICS OF PURE HYDROCARBONS. Developed under American Petroleum Institute Research Project 45. Published by American Society for Testing Materials, 1916 Race Street, Philadelphia 3. 96 pp. $6.

This publication is being issued to make generally available the data on the knocking characteristics of pure hydrocarbons that have been developed under API Research Project 45.

The project has been extensive and entailed a considerable amount of research work carried out at Ohio State University in the preparation of the hydrocarbons and at several research organizations equipped with engines to measure the knocking characteristics of the hydrocarbons. General supervision of the project was under Prof. C. E. Boord of Ohio State.

Objective of the project was to obtain samples of a wide variety of pure hydrocarbons and to relate their structures and physical characteristics with their respective knock limitations in engines. A variety of engine types and operation procedures were selected for this investigation because of the important effect of these variables on knock ratings of the hydrocarbons.

Data are presented in three sections according to the test method employed:

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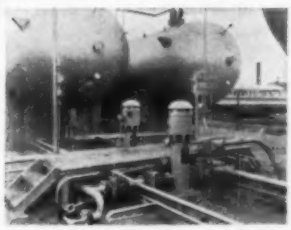

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Putting Ideas to Work

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Atlas installs first C_6 Penex unit

A UOP Penex unit for the production of a high-octane, negative-sensitivity isomerized hexane fraction has recently been placed in operation by Atlas Processing Co., Shreveport. The successful operation of this unit represents the first commercial application of hydroisomerization for the production of motor-fuel isohexanes.

BY VERNON B. CHANCE,
President, Atlas Processing Co.,
and
GEORGE F. ASSELIN,
Universal Oil Products Co.

THE CHARGE STOCK to the Shreveport refinery is a low-sulfur natural distillate which boils almost entirely within the gasoline boiling range. This material is a saturated fuel having low sensitivity and is, of course, stable from the standpoint of gum formation.

It has a high natural content of benzene which is extracted and sold. The octane number of the remaining material needs improvment and it is desirable to obtain this result with a minimum loss of product, a minimum increase in sensitivity and a minimum increase in volatility.

Octane improvement was first obtained by the installation of a Platforming unit in 1952 followed, in 1955, by a second Platformer to handle the balance of the C_7 + distillate. These units were designed to minimize volatility increase at the designed octane number when processing the C_7—400° F. distillate.

After careful study, Atlas decided to base its most recent increase in gasoline octane rating on the addition of a Penex unit for the isomerization of the hexane fraction, the design charge capacity of which is 3,800 bbl. per stream day (BPSD).

This addition not only increased the octane rating of its premium and regular grades, but gained this increase with an improvement in sensitivity at little or no increase in vapor pressure, and only a slight decrease in the 50% distillation temperature.

While the desired octanes could have been obtained solely by greatly increasing the reforming severity on either or both of its Platformers, this would have been achieved only at the expense of greater sensitivity, as well as significantly higher volatility and also lower yields.

Isomerization of the hexane fraction appeared to offer advantages in both yield and volatility control, as well as the desired improvement in octane quality. These advantages in the general case had been described adequately elsewhere,[1 2 3 4] as they apply both to the natural-gasoline processor and to the crude-oil refiner.

Engineering Studies

The total refinery charge contains roughly 30% mixed pentanes and 20% mixed hexanes. Sufficient high-octane isopentane was found in the mixed pentanes to satisfy the demand for blending into premium gasoline at the increased octane level, with no need to produce additional isopentane by isomerization. The n-pentane is of high enough octane rating to permit blending into regular-grade gasoline.

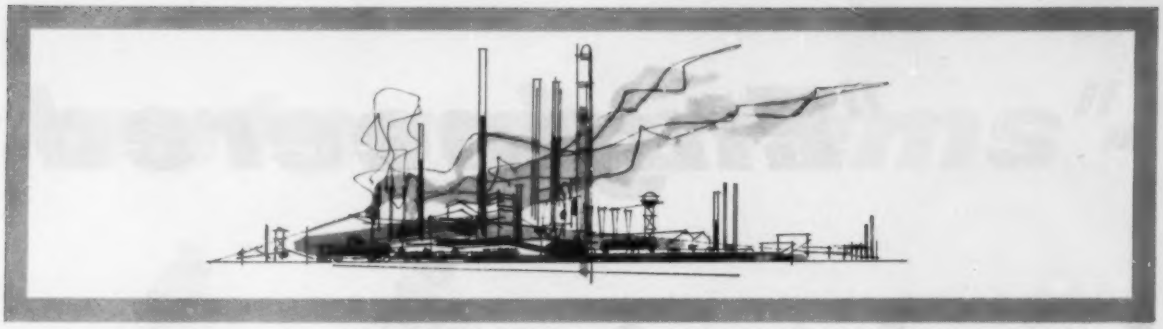
The real obstacle to increased gasoline octane ratings in this case was the 20% of mixed hexanes, which rated only 84 research-method octane number on a fully leaded basis.

The study further showed that the desired proportions of premium and house-brand gasolines could be made at market-dictated octane ratings by properly isomerizing the mixed hexanes. A premium isohexane blending component amounting to 35% of the mixed hexanes would have to be produced at 98 Research leaded octane, and the balance of the hexanes would have to be increased in octane to 90 Research leaded.

Thus the installation of a hexane Penex unit would permit both premium and house-brand gasoline to be raised in octane rating with little volatility increase and at practically no change in over-all yield.

Additional bonus . . . This arrangement made possible an additional bonus which stems from the superior motor octane ratings of the isomerized hexanes. Had Platforming severity been raised to effect all of the desired research octane increase, the motor

(Continued on page 150)



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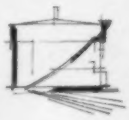

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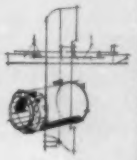

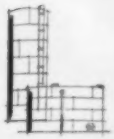

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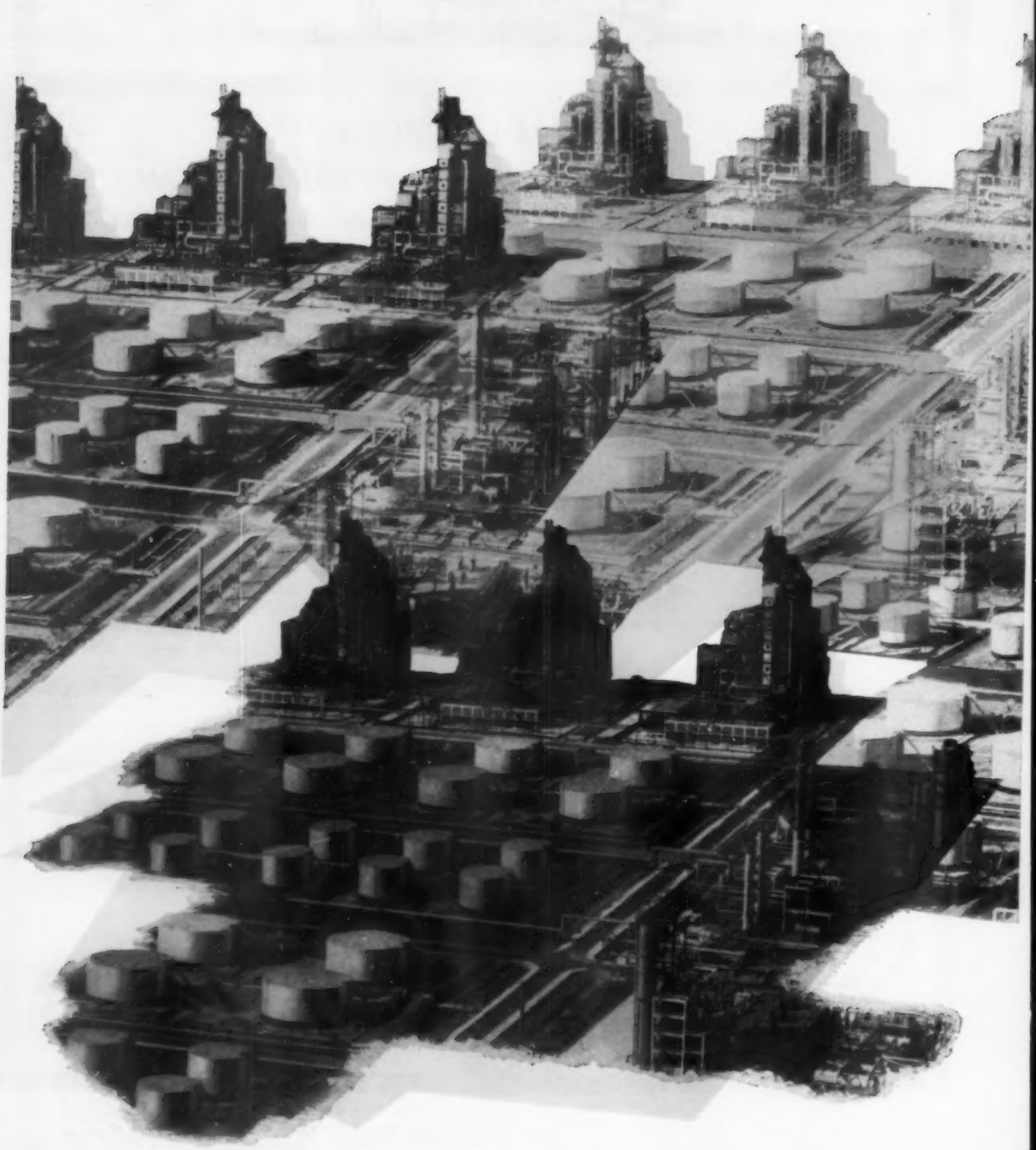
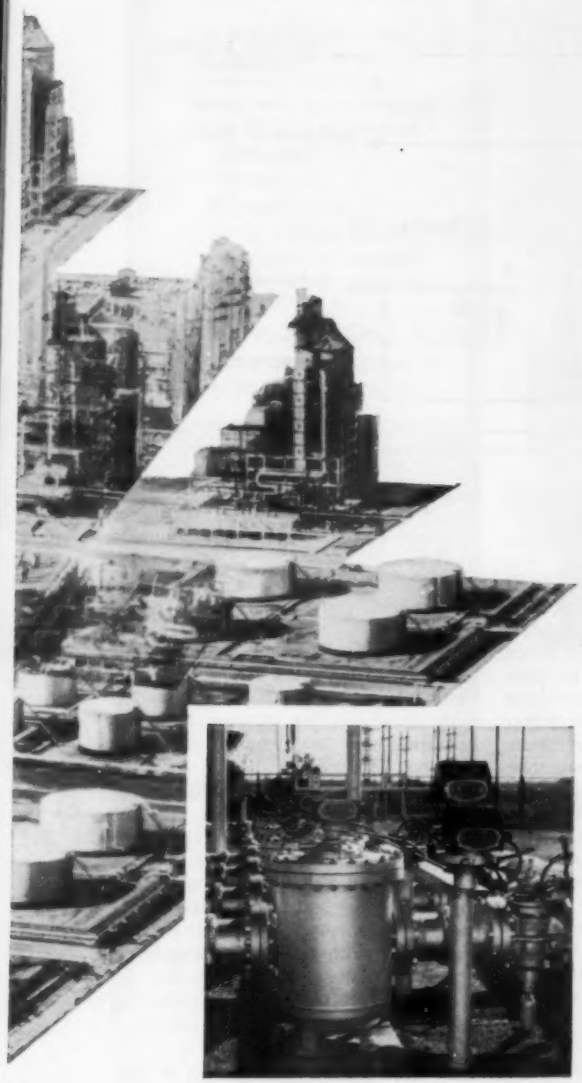


meter systems"-

newest way to refinery expansion without buying real estate



With individual capacities ranging up to 2000 bph, these four A. O. Smith B-200 meters receive crude from a 16-inch line. Meters are connected by combinator units that register total throughout on counter-shifter ticket printer (foreground).

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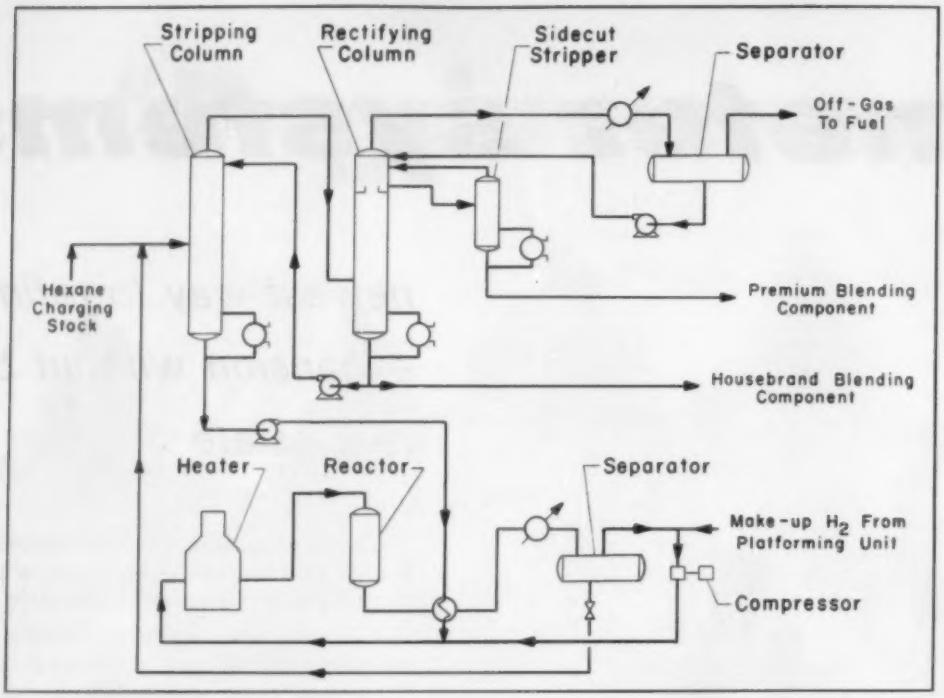

FLOW DIAGRAM of C_6 Penex unit shows fractionator, originally build in two sections for structural reasons, now functions as a single tower. Fig. 1.

octane rating would have gone up by less than an equal amount.

In other words, the sensitivity of the gasoline (i.e., the difference between research and motor ratings) would have increased. This would have been undesirable in the light of current studies of present fuel requirements of the more demanding automobile engines.

A further bonus can be found in the aromatic content of the finished gasoline. The required octane boost was achieved with a smaller increase in Platforming severity than would have been required without Penex. This in turn permitted a smaller increase in aromatic content. Aromatics above a certain concentration are said, by some investigators, to contribute to engine "rumble" and other fuel problems in 1958-59 automobiles.

While the "rumble" problem is not widespread at the moment and does not now confront Atlas, it is one which may become more acute in the future and against which an isomerization unit provides a substantial measure of protection, in addition to its immediate utility.

As the result of these studies, UOP designed and Hudson Engineering Corp. installed for Atlas appropriate pentane-splitting facilities and a Penex hexane isomerization unit. The pentane splitter is rated to recover about 2,400 BPSD of isopentane, at better than 97% purity after debutanization, from 5,000 BPSD of mixed pentanes.

The Penex unit was designed to process 3,800 BPSD of mixed hexanes. The successful operation of this unit since mid-July, 1958, demonstrates the economic and technical feasibility of this important new method of upgrading these low-octane hydrocarbons into high-quality gasoline blending components, in this case particularly tailored to Atlas' requirements.

Process Description

The heart of the Penex process is a platinum-containing catalyst, Type 1-3. With it, either hexanes, pentanes, or mixtures of these may be isomerized in a nonsludging manner with high yields of isomerized products. Because the catalyst has been specially formulated for isomerization, very little carbon is deposited on it. Consequently, catalyst life is long and investment in regeneration equipment, with accompanying increase in both operating and maintenance expense, becomes unnecessary.

Low plant investment is achieved as a result of employing high reactor space velocity and low hydrogen recirculation rate, the nature of the specially-formulated catalyst and the absence of catalyst-regeneration facilities. The process is extremely versatile in that, with suitable fractionation, it can be designed to produce one or more products for gasoline-blending purposes of a range of octane ratings.

Two products . . . The design of the Penex unit to produce two products, each of specified octane and yield, was possible only because UOP had obtained sound data on once-through reactor conversions and had carefully determined blending octane numbers for the individual hexane isomers. Extremely detailed fractionation calculations were also required.

To obtain complete assurance in advance that the commercial unit would perform exactly as desired, the entire plant was duplicated and operated on a pilot-plant scale. The pilot

TABLE 1—PROPERTIES OF C_6 ISOMERS

	Leaded Res. Oct. (F-1) +3 ml. TEL/gal.*	Leaded Motor Oct. (F-2) +3 ml. TEL/gal.*	Boiling point, °F.	Vapor pressure at 100° F. psia.
2,2-Dimethylbutane	106.0	113.1	121.5	9.86
2,3-Dimethylbutane	†118.5	112.1	136.4	7.40
2-Methylpentane	93.1	91.1	140.5	6.77
3-Methylpentane	93.4	91.3	145.9	6.10
n-Hexane	65.3	65.2	155.7	4.96
Methylcyclopentane	105.3	93.0	161.3	4.50
Cyclohexane	97.4	87.3	177.3	3.26

*API Project 45 data (1956). Octanes above 100 converted from ml. TEL/gal. isooctane equivalent using the ASTM Extended Octane Scale (1958).
†UOP data.

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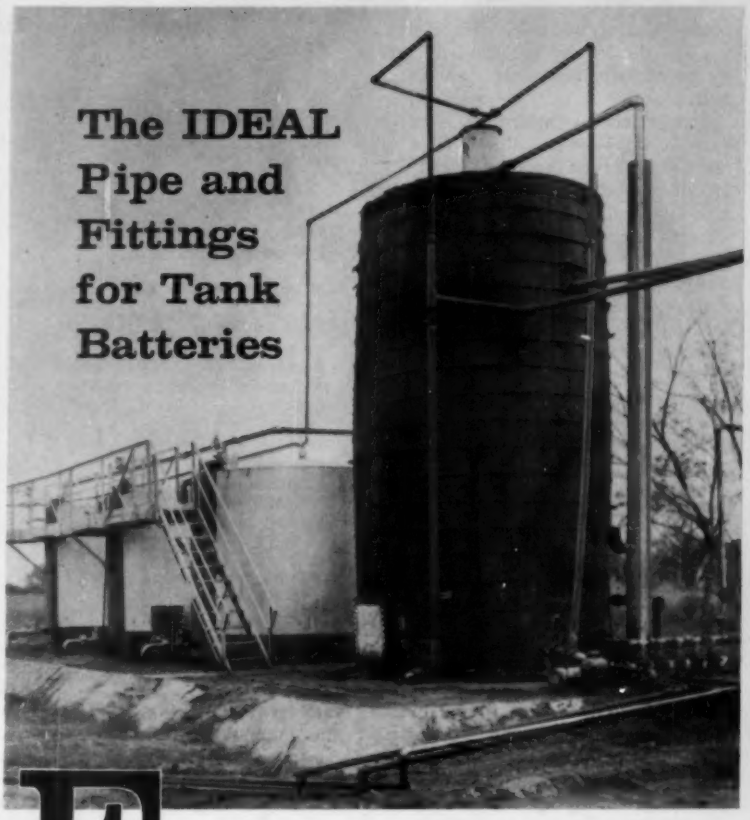

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plant results confirmed the design, and the design was reconfirmed later by the performance of the commercial unit.

Table 1 shows the properties of the various C_6 isomers which enter or leave the Penex process area. The obvious objective is the conversion of n-hexane to a methylpentane or to a dimethylbutane. The over-all extent to which this must be effected is determined by the required octane ratings of the products.

The degree of conversion of n-hexane to dimethylbutanes in a single pass through the reactor is limited by thermodynamic equilibrium. Therefore, it was necessary to select the proper reactor severity, recycle ratio, and degree of fractionation precision to provide the most economical combination for the specified product quality.

Process flow . . . The process flow is shown in Fig. 1. The fractionator was built in two sections for structural reasons but in reality functions as a single tower. The reboiler shown on the second column is small and serves only as a trim device to make fine adjustments in the octane spread between the two products. As a matter of expediency, these two sections are called the "stripping column" and the "rectifying column," respectively.

The charging stock contains some light, high-octane isomers which need not enter the Penex reactor. It therefore enters at approximately the middle of the stripping column, the principal function of which is to prepare as bottoms product a reactor charge rich in n-hexane. After suitable heat exchange, this bottoms stream joins with recycle hydrogen and enters the heater.

The heated hexane and hydrogen then pass under pressure through the single Penex reactor, wherein a substantial portion of the n-hexane is converted to desirable high-octane isomers. The reactor effluent is heat exchanged, cooled and passed into a separator.

The separated hydrogen, together with makeup hydrogen (from the Platforming units) is picked up by a compressor and recycled to the reactor via the liquid charge. The separated hexane, along with light ends and some dissolved hydrogen, is pressured back to the fractionation section.

TABLE 3—CHARGE AND PRODUCT INSPECTIONS

	Fresh feed	Premium product	House-brand product
°API gravity at 60° F.	79.6	83.2	79.6
Distillation, ASTM D-86-56:			
I.b.p., °F.	143	128	143
10%	146	131	146
50%	147	133	147
90%	150	136	151
End point	156	138	158
Reid vapor pressure, psi.	6.2	8.1	6.5
Octane ratings:			
Research (F-1), clear	60.6	83.9	70.2
Research (F-1), +3 ml. TEL/gal.	84.2	98.4	90.1
Motor (F-2), clear	60.2	83.8	69.8
Motor (F-2), +3 ml. TEL/gal.	85.2	103.2	90.3
Composition, wt. %:			
C_4	...	Trace	...
Isopentane	...	0.7	...
n-Pentane	0.4	1.3	0.1
Cyclopentane	0.7	1.3	0.3
2,2-Dimethylbutane	2.9	30.9	2.3
2,3-Dimethylbutane	5.0	14.0	7.3
2-Methylpentane	28.9	43.2	41.1
3-Methylpentane	16.0	8.1	23.5
n-Hexane	37.2	0.5	16.2
Methylcyclopentane	6.1	...	7.6
Cyclohexane	1.6	...	1.1
C_7+	1.2	...	0.5

Product fractionation . . . The rectifying column performs several functions, but its principal purpose is the fractionation of the product into two streams having the desired octane ratings. The lower-octane product, improved in rating with respect to the charging stock, is withdrawn from the bottom of the rectifying column for use as a house-brand gasoline-blending component.

The higher-octane product is withdrawn as a side cut from a point near the top of the rectifying column through a small side-cut stripper which provides precise vapor-pressure control. This product is employed as a blending component for premium-grade gasoline.

The few trays above the premium side-cut draw serve as a stabilization section and permit, with negligible hexane loss, the elimination of the hydrogen and light ends which entered the fractionation section with the reactor separator liquid.

The net gas from the rectifying-column overhead system contains, in addition to hydrogen, light ends derived partly from those accompanying the makeup hydrogen and partly from hydrocracking in the reactor.

The Penex unit was designed to charge 3,800 BPSD of a hexane fraction derived from a phenol extractive-distillation plant which denudes it of benzene. Its performance at the design rate is shown in Table 2. Various self-explanatory inspections and compositions are presented in Table 3.

Table 2 shows that from 3,808 BPSD of charge the unit produces 1,364 BPSD of 98.4 octane-number premium product and 2,339 BPSD of 90.1 octane-number house-brand product, both on a fully leaded research-method basis. The total liquid yield is 97.2 volume %.

With the increasing emphasis being placed throughout the refining industry and by pipeline companies on motor-method (F-2) octane ratings, the Penex products will be found even more attractive as blending components. Not many high-octane stocks rate higher by the motor method than by the research method, i.e., have negative sensitivities, but both of the Penex products are in this category.

The premium product is outstanding in this regard, rating 103.2 motor method and 98.4 research method.

TABLE 2—PENEX UNIT FLOW RATES AND YIELDS

	B/D	Vol. %	Octane ratings—Res. (F-1) +3 ml. TEL/gal.	Octane ratings—Motor (F-2) +3 ml. TEL/gal.	R.v.p.
Fresh feed	3,808	100.0	84.2	85.2	6.2
Premium product	1,364	35.9	98.4	103.2	8.1
House-brand product	2,339	61.3	90.1	90.3	6.5
Total liquid product	3,703	97.2	...	...	...

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4. Belden, D. H., World Petr., July 15, 1956.

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In larger sizes, *Silco-Flex* insulation is used. In this system, silicone rubber is vulcanized into a homogeneous mass to form a flexible, moisture and heat resistant, void-free dielectric barrier around coils and leads.

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Two revolutionary insulating techniques developed and pioneered by Allis-Chalmers mean savings of millions of dollars for motor users . . .

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Basic insulation systems

Larger *Super-Seal* motors with form-wound stator coils use the *Silco-Flex* insulation system. Heart of this system is a remarkable rubber-like silicone elastomer, applied in semi-cured state and vulcanized to form a void-free, impervious dielectric barrier. More than four years of development and field testing have proven the superior electrical and physical properties of *Silco-Flex* insulation systems.

Stator coils of smaller random-wound motors are protected by equally effective *Poxeal* insulation system. A tough, durable case of epoxy resin completely seals the winding end turns and slot portions. Bonded to the stator laminations, it forms a seal completely impervious to contaminants.

Moisture resistance

In addition to being void-free, the silicone elastomer used in *Silco-Flex* insulation is moisture repellent. Even in high humidity, moisture does not form a surface film of condensation. Coils with this protection can operate completely immersed in water. In fact, one of the recommended cleaning procedures is use of detergent and water.

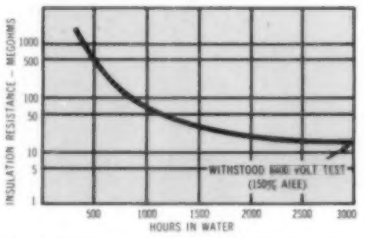


Fig. 1—Test curve shows insulation resistance of *Silco-Flex* insulation while immersed in water.

Moisture resistance of *Silco-Flex* coils is demonstrated in Fig. 1. After more than 3000 hours of total immersion with 2300 volts impressed on the coil, the test was terminated when it became apparent that little more drop could be expected in the coil's insulation resistance. At that point the coil still withstood a high potential test of 8400 volts without injury.

Encapsulated stator windings are equally well sealed. Motors with *Poxeal* insulation protection have been thoroughly tested under water while operating with full load and full voltage.

Resistance to contaminants

Silicone elastomers and epoxy resins are relatively inert to attack by practically all reactive agents. Further, the void-free construction of insulation systems used in *Super-Seal* motors prevents penetration of contaminants. As a result, *Super-Seal* motors are unaffected by oils, most acids, salt solutions, alkalies, and oils and are ideally suited for such applications.

Thermal stability

Temperature-wise, *Silco-Flex* insulation can easily withstand hot-spot temperatures of 200 C and more—

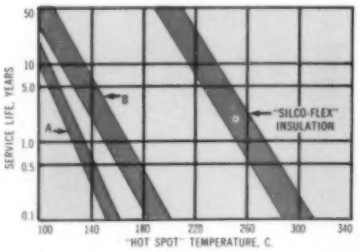


Fig. 2—Chart shows that *Silco-Flex* insulation more than meets Class H requirements.

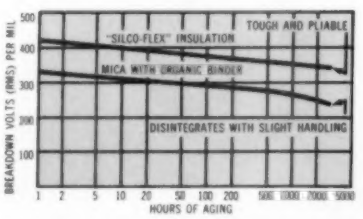
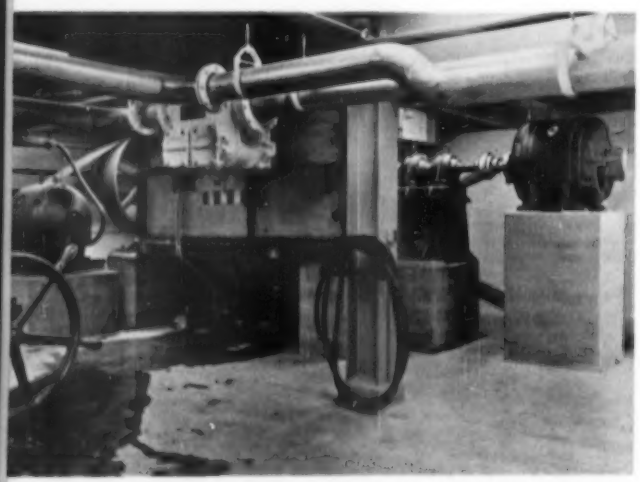


Fig. 3—Tests of 2300-volt insulated bars show thermal stability of *Silco-Flex* insulation.



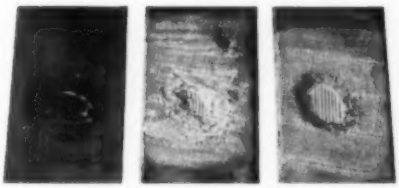
Paper mills have wide application for *Super-Seal* motors because of moist atmospheres.

easily meeting Class H temperature requirements (Fig. 2). At temperatures where the life of Class B coils would be measured in weeks, the life span of *Silco-Flex* coils is well beyond machine obsolescence.

Comparison with a mica-organic binder insulating system (Fig. 3) offers further proof of thermal stability. After 2000 hours of aging at 200 C with 8500 volts applied continuously, the *Silco-Flex* insulated coil was still tough, pliable, and completely serviceable. The mica-taped insulation had deteriorated to the point where it disintegrated readily and was completely useless.

An added advantage of *Silco-Flex* insulation is unusually high thermal conductivity — about twice that of conventional insulations. This means heat dissipates faster from its point of generation.

Poxeal insulation also demonstrates remarkably good thermal stability. Materials now in use are suitable for Class B temperatures, although actual classification of the insulation is determined by the basic material used.



Silco-Flex Insulation | Polyester Mica Tape | Asphaltum Mica Tape

Fig. 4—Samples of motor insulations after sandblasting give comparison of abrasion resistance.

Abrasion resistance

Resistance to abrasion is still another point of superiority in the insulation systems used for *Super-Seal* motors. Abrasion resistance of *Silco-Flex* insulation is compared to other types of insulation in Fig. 4. After one minute of sandblasting with 90-grit aluminum oxide and 100-psi air, only slight surface erosion appeared on the *Silco-Flex* sample. Other insulations were eroded to bare copper.

Application practices obsolete

The superior qualities of *Super-Seal* insulating systems, developed by Allis-Chalmers, make it necessary to reappraise present application practices. With virtually ageless insulation, *Super-Seal* motors assure more reliable service and require less upkeep than the best protected, conventionally insulated machines — and at considerably less cost.

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Rated Horsepower (Maximum Hp, TEFC)	Maximum Continuous Hp—*Super-Seal* Motor
15 hp	17.25 hp
25	28.75
40	46
75	86.25
125	143.75
200	230
350	402.5
500	575

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888 S. 70th St., Milwaukee 1, Wis.

Motor Data

1. Type (i.e., squirrel cage):

Horizontal ☐ Vertical ☐

Hp..... Rpm.....

2. Phase..... Frequency.....

Voltage.....

3. (For synchronous only)

Power factor.....

Starting torque.....

Pull-in torque.....

Pull-out torque.....

Application Data

4. Description of application:

5. Drive: Direct-connected ☐

V-Belt ☐ Other:.....

Starting load.....

Ambient temperature.....

6. Operating conditions:.....

Dirty ☐ Clean ☐ Wet ☐ Dry ☐

Other.....

Information on Existing Motors

(for comparison)

7. Type of insulation

Type of enclosure

Time rating.....

Temperature rise.....

Bearings:

Anti-friction ☐ Sleeve ☐

8. Special characteristics or construction:

NAME.....

TITLE.....

COMPANY.....

ADDRESS.....

A-5869

ALLIS-CHALMERS

Pick the right pipe for the right job

Piping, Valves, and Fittings . . .

Piping plays an important role in the petroleum industry. It is the means of transporting materials continuously and economically. Refinery piping systems are in either of two groups—process piping, which handles all petroleum and chemical products, and utility piping, which handles water, steam, fuel, gas, and air.

THE PROCESS piping may be divided into piping within operating units, and piping outside of operating units or so-called yard piping, including piping in tank fields.

Specifications for process piping within units depend upon the individual process design and operating conditions of the unit. These conditions may involve extremes of temperature, pressure, or vacuum, or a combination of these, and in addition may involve corrosive conditions. Specifications for process piping outside of operating units are standardized for most process lines since these lines are used primarily to transfer materials under mild conditions, to storage or to other process units. With few exceptions specifications for utility piping are standardized for each utility, whether inside or outside operating units.

The materials and method of manufacture frequently dictate the ultimate service of the pipe or fittings. Cast-iron pipe is manufactured with integrally cast flanges, with bell-and-spigot ends, with bell-and-spigot ends having bolting lugs, and with threaded ends for use with couplings. This pipe is used for underground water lines, sewers, condenser boxes, and drains primarily because it resists soil corrosion and is not expensive. The bell-and-spigot cast-iron pipe is most commonly used in the refinery. For water lines and for field oil lines, cast-iron flanged valves are generally specified.

Brass pipe, valves, and fittings are used in sulfuric acid service at medium temperatures and pressures, approximately 250° F. and 150-psi. pressure. Steel pipe with lead lining bonded to the inside of the steel pipe is also used for this service. Lead pipe is used in sulfuric-acid service up to 150° F. and 100 psi. Karbate and graphite are used as a protective interlining of lead-liquid equipment. Seamless copper tubing and copper fittings are used for instrument piping and steam-tracing larger process lines. Clay pipe and fittings, fabricated with bell-and-spigot ends, made from surface clay, fire clay, or shale are used for sewers. Concrete pipe, plain or steel-reinforced, is used for sewers and water lines of the larger sizes.

Carbon steel is the preferred refinery piping material because of its superior strength and low cost. Carbon-steel pipe is available in several classifications of strength. There is a choice in the steel grade, the seam construction, and the pipe thickness.

Standards of steel quality have been set up by ASTM, API, ASA, and SAE. A good grade of pipe steel for example is ASTM A-106 Grade B. A pull of 60,000 lb. is required to break a 1-sq.-in. bar of this steel.

Pipe when manufactured without a seam is known as seamless steel pipe. This is very strong pipe and is preferred for making pipe bends.

Butt-welded pipe has two meanings. The old type of butt-welded pipe, actually a forged butt-jointed pipe, had very poor strength qualities; in fact, this pipe was not acceptable for refinery use except in sizes of 1 in. or smaller. The new type of butt-welded pipe has actually a welded seam and is almost as strong as a seamless steel pipe.

Lap-welded pipe has a lapped forged joint and is used where the strength requirements are not too severe. Lap-welded pipe is about half as strong as seamless steel pipe.

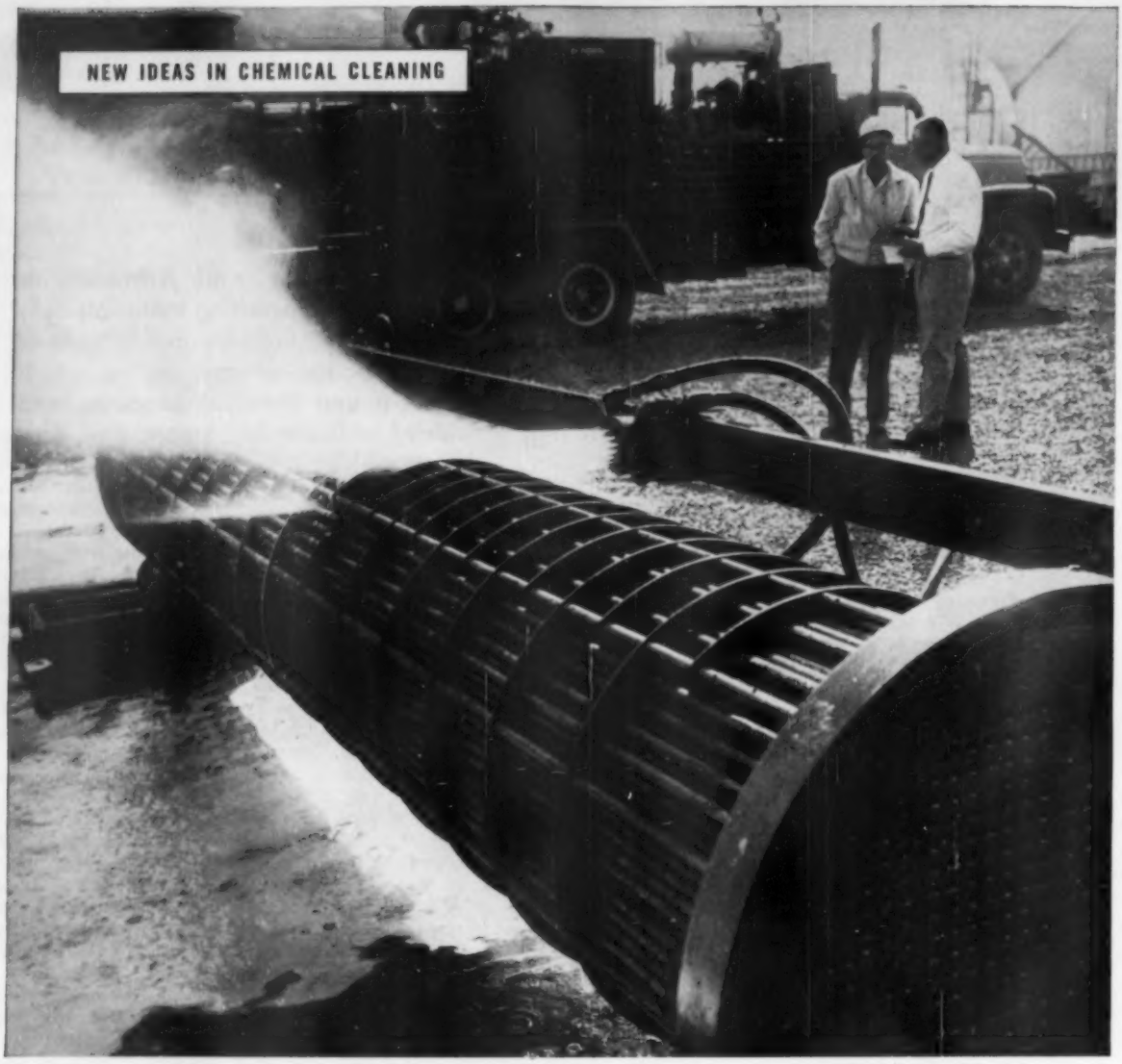
At 650° F., steel pipe is only two-thirds as strong as at 100° F. When design temperatures of 1,000° F. are required only seamless steel pipe is used and the strength at this temperature is only one-fourth of the strength at 100° F.

The dimensions of welded and seamless steel pipe are the same for a given size and schedule. Pipe is available in there common wall thicknesses: standard weight, extra strong, and double extra strong. These classifications are also known as Schedule 40, Schedule 80, and Schedule 160, identified in the same order.

The following tabulation using ASTM A-106 Grade B seamless steel at 100° F. shows a comparison of the three standard weights of pipe. Small pipe is much stronger than a larger pipe with the same wall thickness. The values shown are all at 100° F. and like cast or forged steel the strength at 650° F. is about two-thirds of the values at 100° F. and the strength at 1,000° F. is only about one-fourth of the values shown.

Pipe Size	Outside Diameter	Working pressure in psi. at 100° F. and safety factor = 5					
		Standard pipe wall		Extra strong pipe wall		Double extra stg. pipe-wall	
in.	in.	thickness	psi.	thickness	psi.	thickness	psi.
1	1.315	.133	2,410	.179	3,250	.358	6,550
2	2.375	.154	1,560	.218	2,200	.436	4,410
4	4.500	.237	1,260	.337	2,050	.674	3,580
6	6.625	.280	1,005	.432	1,560	.864	3,140
8	8.625	.322	895	.500	1,390	.875	2,440
12	12.750	.375	700	.500	940	.875	1,660

This material taken from process-training-program manual, Baton Rouge, La., refinery of Esso Standard Oil Co.



New Jetting Tool To Clean Tube Bundles Saves Thousands Of Dollars

The new high-pressure hydraulic tool, shown above, is currently saving thousands of dollars for companies in the refining, chemical, and petrochemical industries. It is the jetting tool developed by Dowell to remove deposits from heat exchanger tube bundles.

Previous methods of cleaning these bundles have been costly, time-consuming and often inadequate. Many times bundles had to be replaced completely because of the lack of a suitable cleaning method.

This new Dowell tool has a remarkable record of thorough, fast cleaning. For example, a slurry reboiler exchanger bundle, three feet in diameter and 16 feet long, was fouled with deposits of coke and asphalt. After being jetted from only one side, the bundle was thoroughly clean. Time required: less than one hour.

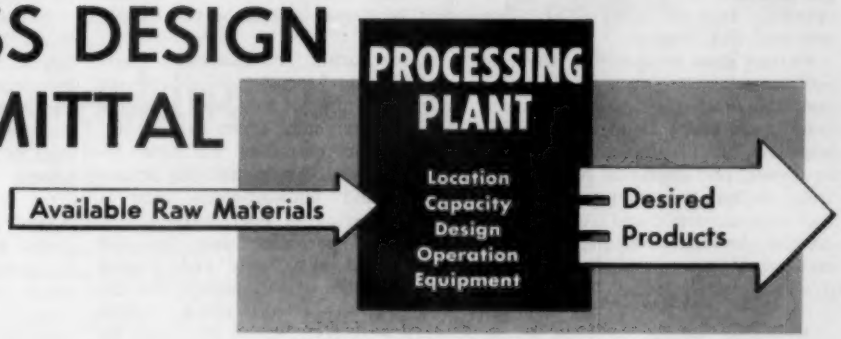
The tool holds the bundle in place for cleaning and has flanged rollers for rotation. The jet-head is manipulated automatically so that all tube spaces are covered. The jetted liquid can be either water or chemical solvents.

This high-velocity jetting device is another example of the new ideas Dowell continues to offer in chemical cleaning to help you cut your costs. Whatever the cleaning problem in your plant, call Dowell for an engineered recommendation. Dowell — the largest, the oldest, the most experienced chemical cleaning service — Tulsa 1, Oklahoma; and 165 stations and offices in major industrial centers.

Chemical cleaning service for all industry DOWELL

DIVISION OF THE DOW CHEMICAL COMPANY

PROCESS DESIGN TRANSMITTAL



The process-design transmittal embodies the results of all the engineering activities involved in the process design of a commercial petroleum, petrochemical, or chemical plant. It constitutes the basis for the detailed and definitive design and engineering work which follows the process design.

BY D. J. ORIOLO
Catalytic Construction Co., Philadelphia

THE PROCESS-DESIGN TRANSMITTAL is an extremely valuable record of process technology gained on a specific plant design and, as such, serves as a guide and reference for future designs.

For instances where operating manuals are to be provided for starting up a particular plant, the process-design transmittal is quite useful in that it provides an accounting of the basic operation and premises upon which the selected process and operating techniques are based.

Introduction

The introduction should provide a brief resume of pertinent information relative to the plant design, including historical background data, plant location, plant capacity, and major plant functions.

As a minimum, it is desirable to mention the products to be manufactured and to summarize briefly the processes used, emphasizing any which are new and patentable. Other items to mention would include the production rates, plant operating factors, product yield and quality, and any major economic factors on which the process design was based.

Provide a preview of what the process-design transmittal covers and what can be expected in the discussion which follows.

Process Description

A clear, concise description of the process and general operating characteristics should be presented, referring to the process flowsheet, to drawings on equipment arrangements, and to enginering flowsheets, if available.

The description should cover not only the various processing steps, but should also discuss those phases of the operating and equipment functions which affect the design and physical layout but may not be subject to graphic portrayal on the process flowsheet. Such an example would be a description of the sequence of steps in a batch process, including operating cycles and probable shutdown periods.

The normal conditions of operation for the major processing steps should be given. Operating temperatures, pressures, volumes, etc. should be specified, with comments on variations or ranges in conditions.

Reference should be made to any design considerations specific to an unusual operation or to special, standby emergency equipment.

Explain the general nature of any hazards which may be associated with the process, materials handled, or equipment involved and give general recommendations for precautionary methods to protect against hazards.

Outline any special process requirements relative to plant startup or shutdown, including emergency considerations.

The chemistry of the process should be presented in enough detail to define the major chemical reactions for the various processing steps. Reaction rates heat-evolution and/or heat-absorption values; and all other pertinent kinetic, reaction-equilibrium, and thermodynamic data should be outlined.

The effect of the major process variables on process chemistry should be explained, emphasizing the need, when applicable, of maintaining process variables within desired operating limits to achieve proper yield and quality of product. Some of the important variables influencing process reactions would include reaction temperature, reaction pressure, retention time, concentration of reactants and catalytic agents, and various contaminants and impurities, which, if introduced into the process, could poison the reaction.

Design Basis

Enough process and engineering data should be presented to define clearly the premises and criteria upon which the process design of the plant was formulated. Those factors should be explained which entered into considerations for the selection of recommended equipment and techniques for the handling and storage of raw materials and chemicals; for the various processing steps, for the storage and handling of products, and for the disposal of all waste streams.

Basic design factors to summarize are criteria on plant size, capacity, location, layout and arrangement; type of operation (continuous or batch); and design conditions of operation and operating factors necessary to achieve the desired productivity, product yield, and product quality. Process conditions to stipulate cover such factors as throughputs, reaction temperatures and pressures, concentrations of catalyst and reacting material, and retention times.

Other design criteria . . . This may cover such aspects as flow data (e.g. slurry velocities, gas-disengaging velocities, agitation speeds); heat-transfer data (coefficients, fouling allowances); separation of components, including data on phase equilibria, stage heights, stage efficiencies, minimum reflux ratios, etc.; topographical data; weather

data; pertinent elevations on buildings, structures, and railroads; and manpower requirements for the various operating steps, including maintenance and analytical control.

Factors must be specified, covering performance tests, process evaluation and economic considerations which enter into the scaleup, design and selection of all the major process equipment and important process controls, including recommended materials of construction and corrosion and erosion allowances. All pertinent data on corrosion tests should be presented.

Material Requirements

Reference should be made to the over-all material balance, which is usually tabulated for each flowing stream quantity on the process flowsheet. A block diagram may be used to emphasize and show the material-flow quantities and interrelationships for the major processing steps.

Listings should be tabulated giving periodic requirements (daily, monthly, or yearly basis) for all feed stocks, chemicals, and other materials used to make the equivalent quantities of products and by products, including process wastes.

Reference should be made to all listings, as shown in the appendix, covering physical and chemical properties of all materials handled (gases, liquids, slurries, solids) which affect the selection and sizing of equipment, piping, and controls. Be sure to include properties such as combustion characteristics, flash points, flammability, explosive limits, toxicity, etc. on materials which are hazardous.

Utilities

Summarize the utilities requirements for the over-all process and for each major piece of equipment. It is often desirable, particularly for complex processes, to show the requirements for utilities such as steam, water, air, and fuel on block diagrams. A separate diagram may be used for each particular utility or else all utilities may be shown over-all on one master diagram.

Show normal and maximum loads and indicate general requirements on quantities, temperatures, and pressures for each particular utility (air, steam, water, and fuel). For electrical requirements, note the installed horsepower and kilowatt-hours over a specific period of operation.

Provide pertinent data on the source and availability and general characteristics of each utility. For example, water from various sources (deep well, river, lakes, etc.) may be used in different services and thus it is important to differentiate, giving water analyses and minimum and maximum expected water temperatures and pressures.

For dry air, the dew point should also be specified. For fuels (fuel oil, LPG, natural gas, coal), give the heating value and other pertinent physical properties.

If available, give the estimated unit costs for each utility.

Equipment list . . . A complete list of all the major process equipment and important process controls must be listed. It is desirable to list the equipment by category, for example, by vessels, by heat exchangers, by pumps, etc. In addition to item number, list the equipment title, the service, the construction material, and the size or capacity for each equipment piece.

Equipment Specifications

Basic design requirements must be specified before any of the major process equipment and important process controls can be selected.

In accordance with the practice of most manufacturing and engineering contracting organizations, use specific equipment data sheets or equipment schedules to transmit process and mechanical requirements necessary to meet required performances.

For standard manufacturer's equipment, such as pumps, compressors, filters, centrifuges, agitators, dryers, evaporators, grinding equipment, and the like, it is important to specify sufficient information on fluids handled in addition to required performances.

Vessels . . . On vessels, such as storage tanks, fractionators, reactors, or units of special design, it is usual to supplement the information on required process requirements with process sketches.

For major control elements, such as motor-control valves, flowmeters, and relief valves, it is customary to provide information on ranges of flowing quantities, physical characteristics of materials processed, allowable pressure drops, and related process requirements.

In all instances, materials of construction must be specified or, at least, sufficient information must be presented on the corrosive or erosive properties of materials handled.

Include the process flowsheet and other drawings, if available, such as site and plot plans, engineering flowsheets, and equipment arrangements.

Appendix

The appendix should contain all detailed data, tabulations, correlations, calculations and related material, which support and pertain to the basic process design of the plant. Examples of information to include are:

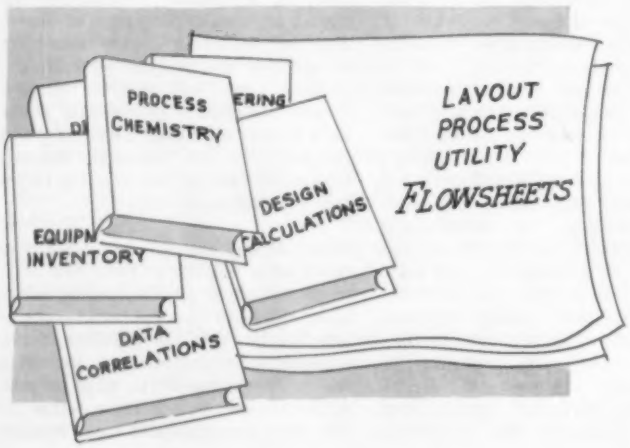
- Design data—Include any detailed listings of technical and design data, such as results on corrosion tests or on equipment-performance tests.
- Design calculations—Present all of the basic equations and indicate the calculation methods employed in equipment design and selection, giving typical calculation examples, when necessary to clarify the particular problem.

All calculations may be in neat, legible longhand, on transparent paper which can be duplicated. Whenever possible, use correlations on graph paper to aid or illustrate the calculations involved.

- Physical and chemical properties —Include tabulations of physical properties and analyses, when available, of all feed stocks, chemicals, and products.

Show data or characteristics of utilities, including analyses of water from all sources under consideration.

Present correlations on graph paper to illustrate the effect of changing process variables on the properties of flowing process streams.



Thermal cracking yields

. . . from paraffinic and naphthenic base stocks

BY W. L. NELSON
Technical Editor and
Petroleum Consultant

In your answer of November 17, 1958, entitled, "Effect of Wax on Value of Crude Oil," you suggested that cracking plant yields from waxy stocks are only "slightly" larger than from nonwaxy or naphthenic stocks. Isn't the yield from the paraffinic material very much larger? F.E.P.

The word "slightly" was used because of the erroneous concept that paraffinic stocks are greatly superior whereas they are only mildly superior. The situation is outlined in Fig. 1 which was computed from the yield formulations shown on pages 637-641 of the fourth edition of Petroleum Refinery Engineering (McGraw-Hill Book Co., New York, 1958). For ordinary intermediate-base oils (11.8 characterization factor) the presence of normal amounts of wax as against no wax, indicates the following approximate increases in thermal cracking yields, due to wax:

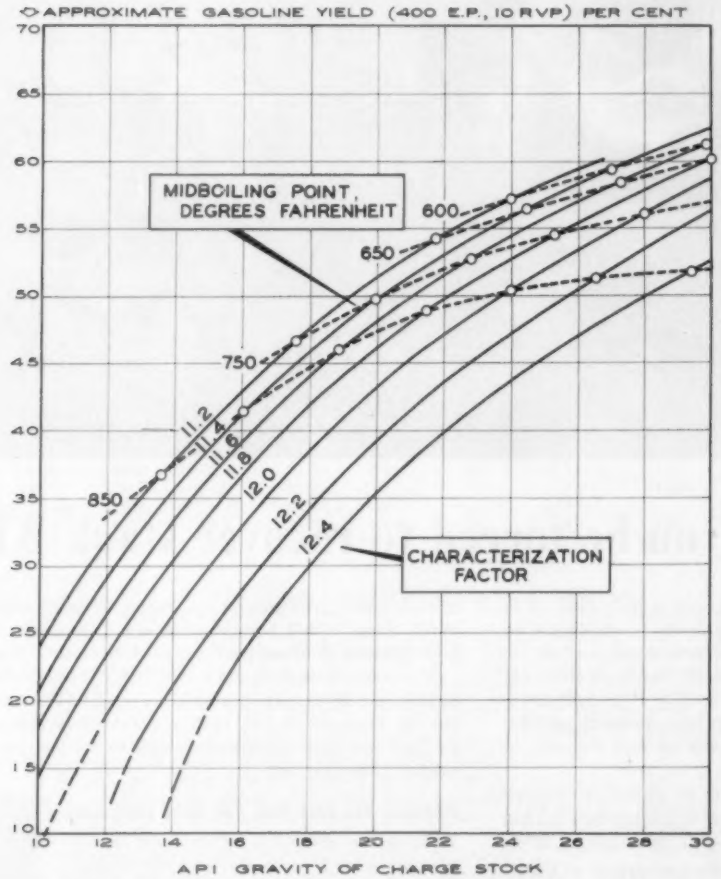
20° API	1.5%
23° API	1.3%
26° API	0.9%

At the same time, the octane number decreases by about 1½ units. Of course, if exceedingly large amounts of wax are present (as 40 to 60% by weight in the paraffin distillate), cracking yields are increased more by the presence of the wax, attaining increases of 4 to 5%.

The misconception regarding high yields from paraffinic feed stocks stems from two factors (1) yields from high-gravity paraffinic feeds are compared with yields from low-gravity naphthenic feeds, and (2) operators do not realize that much lower-gravity fuel oils can be produced from naphthenic feeds. In actuality, for a fixed gravity of feed stock, the yield from paraffinic stocks is very much lower (see Fig. 1) than from naphthenic stocks (about 14 to 43% lower). With respect to the gravity of the cracked residuum that is produced, it is not difficult to produce a 4° API cracked fuel oil from naphthenic residual feed stocks but with highly paraffinic residues, the gravity of the cracked fuel oil may need to be 11° API or higher in order to meet viscosity requirements.

Perhaps the most correct or useful comparison is shown by the dashed lines in Fig. 1. These show the thermal cracking yields from feed stocks of the same midboiling point. Here it is evident that paraffinic or waxy feeds have a small advantage. Thus for 750° F.-midboiling-point feeds, the yields from a wide range of feeds. are:

Characterization factor	API of feed	Gasoline yield, %	Motor O.N.
11.4	20.0	49.7	73.0
11.8	25.3	54.4	69.0
12.2	30.7	57.0	below 65.0



THERMAL CRACKING YIELDS from residual feed as a function of characterization factor or paraffinicity. Fig. 1.

—Photo courtesy Standard Oil Company (N.J.)

How soon will you be forced to recover stack BTUs?

The constant rise in cost of fuels means simply this: it is becoming more and more uneconomical to dissipate so much of your fuel up the stack. Particularly, since so much of it – nearly one third – can be put *back to work.*

For with modern process equipment, which includes a Ljungstrom Air Preheater, you can save as much as 30% of the fuel burned! That's a *saving of 1½ barrels in every five.*

Heat recovery can also be used to generate higher flame temperatures and increase heat-transfer rates. This makes it possible to *raise through-put as much as 25%.*

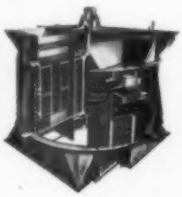
LJUNGSTROMS ARE WRITTEN OFF FAST

Ljungstrom has many other advantages. More complete combustion greatly reduces slagging . . . makes possible use of lower grade fuels . . . helps raise product quality. With these added benefits it's not difficult to see why a Ljungstrom is often paid out in less than a year.

For more complete data on what Ljungstrom Air Preheater can do to help you save on production costs . . . and for an analysis of the heat recovery benefits obtainable in fuel burning equipment – call or write the Air Preheater Corporation.

Wherever You Burn Fuel, You Need Ljungstrom

The Ljungstrom operates on the continuous regenerative counterflow principle. The heat transfer surfaces in the rotor act as heat accumulators. As the rotor revolves, the heat is transferred from the waste gases to the incoming cold air.



The Air Preheater Corporation 60 East 42nd Street, New York 17, N. Y.

BY W. L. NELSON
Technical Editor and
Petroleum Consultant

Average wages and number of refining employes

INDEXES are established in the tabulation on this page so that labor cost data collected during the past can be brought to a 1956 basis for comparison. The indexes and wages are the average for the entire United States, and corrections must thus be applied to care for the difference in wages in different localities.

Likewise, it is necessary to correct for differences in the policy of management—independent refiners often use fewer employes than indicated here (at wages that are occasionally higher than the averages shown here), and major refiners may have more employes than the averages shown here. Inasmuch as the major companies constitute the bulk of the refining industry, the figures shown here are more applicable to large than to small refiners. The various corrections mentioned above will be explored in future issues.

Finally, note again that the table on this page applies to average refineries, not to units or plants within a refinery. However, the wage indexes are probably applicable to any refinery operation.

	Wage Indexes (and Wages*)						Refinery employes (Avg.)‡ per 10,000 B/D capacity				Refinery labor and supervision	
	Manufacturing[1] (1)	Refinery workmen[2] (2)	Approx. refinery supervision[3] (3)	Total refinery employes[4] (4)	Fringe benefits, % of salary[5] (5)	Total refinery payments[6] (6)	Workmen (7)	Others (8)	Total (9)	Productivity index[8] (10)	cost index[9] (11)	cents per bbl.[10] (12)
1926	27.8	29.7	32.8	28.2	†10	†26.1	258	42	300	84.5	†31.0	†15.6
28	28.3	28.7	31.7	...	...	†25.5	..	..	..	† 86.5	†29.5	†14.8
30	27.8	29.7	32.8	28.4	†10	†26.2	246	41	287	88.5	†29.5	†14.8
1931	26.3	29.2	32.3	...	...	†26.0	..	..	..	† 90.0	†29.0	†14.6
32	22.8	25.5	28.2	...	...	†22.5	..	..	..	† 95.0	†23.5	†11.8
33	22.3	25.0	27.7	...	...	†22.5	..	..	..	†100.0	†22.5	†11.3
34	26.8	28.7	31.7	...	...	†26.0	..	..	..	†103.0	†25.0	†12.6
35	27.8	30.8	34.0	29.6	†14	†27.9	214	40	254	100.0	†28.0	†14.1
36	28.3	31.8	35.2	...	...	†28.0	...	...	...	†101.0	†28.0	†14.1
37	31.4	36.0	39.8	34.4	†15	†32.6	210	38	248	102.0	†32.0	†16.1
38	31.8	37.5	41.5	...	...	†34.0	..	..	..	† 98.0	†34.0	†17.1
39	31.8	37.0	40.9	...	...	†33.5	...	...	..	† 0.0	†34.0	†17.1
40	33.4	37.0	40.9	...	...	†33.5	..	..	..	† 95.0	†35.0	†17.6
1941	36.9	38.1	42.1	...	...	†34.5	..	..	..	† 93.0	†37.0	†18.6
42	43.0	42.7	47.3	...	...	†38.5	..	..	..	† 89.0	†43.0	†21.6
43	48.5	45.9	50.7	...	...	†44.0	..	..	..	† 85.0	†52.0	†26.1
44	51.5	48.0	53.0	...	...	†46.0	..	..	..	† 80.0	†57.5	†28.9
45	51.5	48.5	53.6	...	...	†46.5	..	..	..	† 75.0	†62.0	†31.2
46	55.1	52.2	57.7	52.2	18	50.0	280	92	372	68.3	73.1	36.7
47	62.7	57.2	62.0	57.0	†19	55.0	265	90	355	71.5	77.0	38.7
48	68.3	66.0	69.7	65.5	18	63.0	252	90	342	74.2	84.9	42.6
49	70.8	69.2	72.9	67.7	19	65.5	230	68	298	85.2	76.9	38.6
50	74.3	71.8	75.0	71.3	22	69.5	218	80	298	85.2	81.5	41.0
1951	80.5	77.8	80.4	76.9	23	75.5	214	82	296	85.8	88.0	44.2
52	84.5	81.0	83.0	80.7	25	79.8	196	86	282	90.0	88.7	44.6
53	89.5	86.2	87.8	86.7	25	86.0	191	85	276	92.0	93.5	47.0
54	91.5	88.5	90.3	88.5	26	88.1	177	85	262	97.0	90.9	45.7
55	95.2	92.3	93.0	92.5	27	92.5	164	85	249	102.0	90.6	45.5
56	100.0	100.0	100.0	100.0	27	100.0	166	88	254	100.0	100.0	50.2
1956 wage§	$79.99[1]	$108.39	$147.00	$122.00	$32.90	$138.50[2]	...	...	...	....	....	....
57	103.0	104.1	103.3	103.8	28	103.8	167	92	259	98.0	105.9	53.2
58	†104.0	†105.3	104.2	104.9	†29	105.0	†162	†95	†257	†99.5	†105.5	†53.0

*See year 1956 for wages. Wages for other years can be determined by means of the indexes.

†Estimate or preliminary.

‡See Process Costimating No. 46, for corrections for type of refinery management.

§Dollars per week.

1. Employment and earnings, July 1958. Hourly wage rate (1956), $1.976.

2. Employment and Earnings, a monthly publication of the U. S. Department of Labor. Weekly wage rate (1956), $108.39.

3. An estimate. Before 1946 the wages of workmen and the salaries of supervisors were assumed to increase at the same rate. After 1946 the rate of increase of supervisors was assumed to be only 80% of that of refinery workmen.

4. Average of wage indexes of refinery workmen and supervisors, weighted according to the number of each employed. (See Columns 7-9). This applies only to wages and salaries without fringe benefits.

5. U. S. Chamber of Commerce publications on "Fringe Benefits." Includes the value of time (vacations, holidays, sick leave, etc.) as well as actual payments. Included are: social security, pensions, welfare funds, injury compensation, bonuses, profit sharing, rest periods, vacations, holidays, sick leave, etc.

6. Includes all wages and salaries, supplements thereto, paid offtime, and value of nonworking time. The weighted sum of the costs of Columns 2 and 3 but only half (an estimate) of Column 5 because some of the extra employes required in replacing those on vacation, etc., are already included among the total employes (see Col. 9).

7. After 1956, basic information appears in the monthly publication of the U. S. Department of Labor, entitled, "Employment and Earnings."

8. 254.5 (the employes per 10,000 bbl. for 1956) divided by employes at any time (see Col. 9).

9. Wage index for Total Refinery Payments (Col. 6) divided by Productivity Index (Col. 10).

10. 1956 weekly payments ($138.50) multiplied by 254.5 (Col. 9) divided by weekly capacity of 70,000 bbl., times Refinery Labor Cost Index Col. 11).

DOW | **HERBICIDES**

GARLON . . . *new combination chemical*

knocks out weeds and grasses, costs less than cutting

For getting rid of unwanted vegetation, Garlon* is the one right formulation. It's brand new—and unique—from the research labs of Dow. It contains a special combination of powerful herbicides that control both broad-leaved weeds and grasses. It is a systemic killer—destroys roots and all. And Garlon is easy to use. It mixes readily with water, and seven gallons of Garlon properly diluted with water will effectively treat a full acre of land. Professional contractors like its handling ease—and your own maintenance men can apply Garlon and obtain good results.

Some gas and oil companies are still using mowers and man hours to get rid of nuisance weeds and grass around tank farms, pipe lines, storage and equipment areas. But cutting is more expensive and far less satisfactory than spraying with Garlon. Cost comparison figures show that savings are substantial when you switch from cutting to spraying. For more information on chemical control of vegetation and/or the name of a qualified professional contractor near you, send the coupon below to THE DOW CHEMICAL COMPANY, Midland, Mich., Agricultural Chemical Sales Dept.207DC-2-16

*TRADEMARK OF THE DOW CHEMICAL COMPANY

The Dow Chemical Company
Agricultural Chemical Sales Dept. 207DC-2-16
Midland, Michigan

☐ Please send me additional information about Garlon and modern vegetation control chemicals.

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THE DOW CHEMICAL COMPANY, MIDLAND, MICHIGAN

Quick repair prevents gas cutoff

On the Job
PIPELINING

A TELEPHONE POLE turned out to be the handiest object available to temporarily plug a hole in a ripped gas line while repairs were being made. (Photo courtesy Cities Service Gas Co. Dispatcher.)

WHEN HEAVY EQUIPMENT of a highway construction contractor hit a 10-in. line of Cities Service Gas Co. west of Carthage, Mo., a hole some 7-in. across was torn in the pipe.

The pressure at the town border dropped extremely low, but temporary relief was provided by inserting a large wooden plug and increasing the pressure to about 24 psi. at the city limits.

The line was back in service within 40 minutes. Repairs were made without interruption of service to domestic customers in the city of 11,000 population. The job was handled by Mark Hildreth, pipeline foreman at Joplin, and his maintenance crew.

The unusual aspect of the repair work was the makeshift plug. It happened that an old telephone pole was the nearest object of the right size. The pole was inserted into the hole, fastened with wire, and tightened by driving in wooden stakes to reduce leakage.

With the plug in place, pressure at the city limits could be built up to 24 psi. This permitted a shutout so that the damaged pipe could be removed and replaced. The main line was shut out at 1:30 a.m. By then gas use by domestic customers was low.

When the repair was completed, pressure had dropped only 5 psi. While the industrial and commercial load was curtailed, the residential load was not affected by the mishap.

Here's how to weld X52 line pipe

IN an extensive investigation of API Standard 5LX Grade X52 line pipe, the weldability characteristics of two heats of steel shown in Table 1 were investigated.

The pipe tested was 36-in. diameter with ⅜ and ½-in. walls, and was in the expanded condition and represented the extreme chemical limits of the specification. The tests were conducted under the supervision of the applied-research laboratory of the United States Steel Corp.

Girth welds in the 36-in. o.d. pipe were made at 0°, 70°, 150°, and 300° F. For the root pass E6010 electrodes were used and E7010 electrodes were used for the remainder of the weld. The transition temperature was determined with notch bend and Charpy V-notch tests. Underbead cracking tests were also made.

After Magnaflux and X-ray examination of the girth welds, tensile, bend, nick-break, hardness, and metallographic tests also were conducted. The notch-bend transition temperature as determined by the Kinzel notch-bend testing technique and the underbead cracking-susceptibility test results are shown in Table 2.

The underbead-cracking susceptibility test results are based upon a severe weld test. Experience has indicated preheating may be desirable when cracking exceeds 50% in the underbead cracking test. The Charpy V-notch impact-test results shown in Table 3 are particularly interesting in that the transition temperature of the deposited E7010 weld metal and heat-affected zone of the girth weld is low.

Results of the investigation indicated that when ½-in. wall Grade X52 line pipe is field-welded, at an ambient temperature of approximately 70° F. or lower, a preheat temperature of approximately 300° F. should be used to obtain good welding performance.

When ⅜-in. wall Grade X52 line pipe is field-welded, preheating does not appear to be necessary to obtain good welding performance. However, to prevent underbead cracking in the girth welds of ⅜-in. wall line pipe at temperatures below 32° F., preheating to at least 70° F. is desirable.

Preheating when required should be employed before deposition of the stringer pass and a hot pass should

From "Technical Development — High Strength Line Pipe," by W. A. Saylor, chief metallurgist, Consolidated Western Steel Division, and A. B. Wilder, chief metallurgist, National Tube Division, U. S. Steel Corp., presented at Denver ASME meeting.

TABLE 1—CHEMICAL COMPOSITION AND TENSILE PROPERTIES OF GRADE X52 36-IN. O.D. LINE PIPE

Heat number	Wall thickness (in.)	Chemical composition, % C	Mn	P	S	C.E.*	Yield strength, psi.	Ultimate strength, psi.	Elongation in 2 in. (%)
72P415	⅜	0.33	1.10	0.016	0.027	0.61	59,650	87,300	33.0
	½	0.33	1.12	0.017	0.029	0.61	53,900	87,950	32.0
65P374	⅜	0.22	0.88	0.020	0.031	0.44	53,950	72,300	33.0
	½	0.23	0.87	0.020	0.032	0.45	51,450	72,750	36.0

*C.E. is carbon equivalent % C + % Mn/4.

TABLE 2—NOTCH-BEND AND UNDERBEAD CRACKING-TEST RESULTS OF GRADE X52 LINE PIPE

Heat number	Wall thickness (in.)	Initial temperature (°F.)	Notch bend fracture transition* (°F.)	Underbead cracking (%)
72P415	⅜	0	48	54
		300	46	0
	½	0	108	59
		300	79	0
65P374	⅜	0	35	1
		300	31	0
	½	0	86	4
		300	70	1

*50% shear.

How Much Steam Should a Steam Trap Trap?

. . . some answers to commonly asked questions about the primary job of a steam trap

You don't need a doctor's degree in thermodynamics to answer the question at the top of this page. Naturally, a steam trap should trap *all* the steam.

Unfortunately for you, the problem isn't quite that simple. After all, a shut off valve would trap all the steam . . . and condensate, and air, and carbon dioxide as well.

So we'd better amend the answer to the question this way: A steam trap should trap *all* the steam but *must* remove condensate, air and carbon dioxide as rapidly as they accumulate.

With this established, let's take a closer look at what's involved:

A Steam Trap Should Trap All The Steam

If you've had experience with several different makes of traps, you already know that some trap steam better than others. The operating principle of the trap is what makes the difference. We like to talk about it because Armstrong traps are designed so that no steam can get to the orifice. The valve is always water sealed. Result: *More efficient steam utilization, lower fuel costs.*

A Steam Trap Should Remove Condensate

All traps remove condensate—after a fashion. For maximum efficiency in the unit being drained, though, the trick is to get it out without waiting for it to cool and without leaking steam.

Armstrong's water sealed valve takes care of steam leakage. The inverted bucket operating principle opens the trap for water regardless of its temperature. This means you get the condensate out as quickly as it accumulates. Result: *Higher temperatures and better heat transfer in steam heated units.*

A Steam Trap Should Remove Air and CO_2

Part and parcel of the condensate removal problem is removal of air as well as oxygen and carbon dioxide—two real troublemakers. Air tends to reduce operating temperatures and interfere with heat transfer. CO_2 goes into solution to form corrosive carbonic acid which, for example, can eat unit heater tubes. O_2 aggravates the situation. Believe it or not, but all traps don't properly remove air and CO_2.

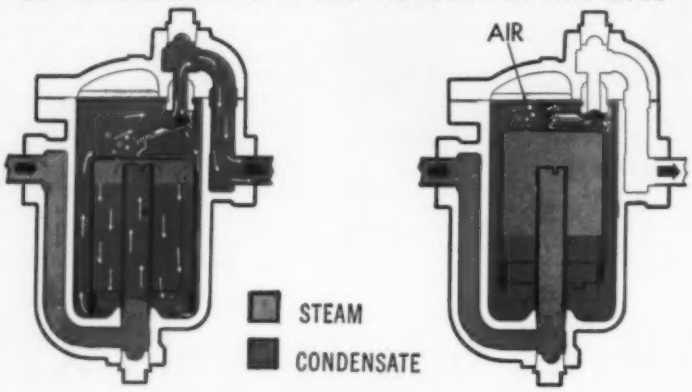
By now, you've probably guessed that Armstrong traps *do* remove air and CO_2. Armstrong design (see illustration) provides continuous venting of air and CO_2. By opening suddenly, the Armstrong trap creates a momentary pressure drop to "pump" the air down to be vented. Result: *Higher temperatures, faster heat-up, better heat transfer and reduced corrosion.*

Note: When required, specially sized air vents are furnished. For fast heat-up of low pressure on-and-off units, Armstrong provides open float and thermostatic air vent traps.

What's the Final Answer?

Summing it all up, you'll get the best service from steam heated units that are equipped with traps designed to trap *all* the steam and remove air and condensate as quickly as it accumulates. In our prejudiced viewpoint, this means Armstrong traps. More important are the several thousand users of Armstrong traps who have proved the point.

HERE'S THE STEAM TRAP DESIGN THAT GETS RID OF CONDENSATE AND AIR WITHOUT STEAM LOSS



Trap open. Condensate entering trap has caused bucket to lose buoyancy. Weight of bucket times leverage pulls valve open. Air is discharged along with condensate.

Trap closed. Steam has floated inverted bucket; valve is held tightly closed by system pressure. Air entering trap passes through bucket vent and accumulates at top of trap.

Before you make up your mind, though, consider the minimum maintenance requirements of Armstrong traps . . . and the convenient assistance your local Armstrong Representative provides. These are important plus values.

Put Up or Shut Up

We're so confident that we "put up". Armstrong traps are unconditionally guaranteed to satisfy. So you can find out for yourself with practically no risk. If you're not completely satisfied with the way they do their job, you can get your money back.

* * *

The 44-page Armstrong Steam Trap book goes into greater detail on these and other Armstrong features. It also discusses trap selection, installation and maintenance. Ask your Armstrong Representative for a copy or write

Armstrong Machine Works
8685 Maple Street
Three Rivers, Michigan

ARMSTRONG STEAM TRAPS

TABLE 3—⅜-SIZE CHARPY V-NOTCH IMPACT-TEST RESULTS OF GRADE X52 LINE PIPE

Heat number	Plate thickness (in.)	Transition temperature, °F.* Base metal L†	Base metal T‡	Weld metal L	Heat-affected zone L
72P415	⅜	6	34	— 64	—6
	½	36	38	—110	2
65P374	⅜	16	34	— 88	2
	½	38	53	— 90	13

*Temperature at 10 ft.-lb. energy absorbed. †L-Longitudinal direction. ‡T-Transverse direction.

follow the stringer bead. If the pipe cools before deposition of the filler passes, preheating should be employed before resuming welding and the weld should be completed before the pipe cools to ambient temperature.

Many years ago the low-hydrogen-type electrode with a lime-base coating was experimentally used in girth welding line pipe. This type of electrode eliminated the necessity of preheating as no weld cracks were encountered at temperatures as low as 25° F. The difficulty encountered, however, was the production of unsound welds. It was not possible to downhill weld and produce sound welds due to the nature of the slag. In hot-tapping oil or gas pipelines, the use of low-hydrogen electrodes, which are dry, should prevent underbead cracking in the weldment.

What's the next step for line pipe?

BY R. G. STRONG

DURING the past 30 years there has been a decided improvement in the properties and quality of line pipe but there is still much to be desired. The use of nondestruction testing both in the mill and in the field is an important inspection tool which is improving the quality of pipe and the resultant pipeline.

In the late 1920's engineers realized that the working stresses for pipe were too low, unnecessary tonnage of steel was being purchased by reason of the heavier walls used. The economy of pipelines was being seriously affected.

The natural-gas line to Chicago, constructed in 1930-31, was the first long-distance, large-diameter, high-pressure, transmission line to use the lighter-wall pipe. This advance changed the concepts of pipeline design and construction, particularly in respect to welding quality.

Big-inch seamless pipe . . . Three new pipe mills were designed and constructed to manufacture 24-in. seamless thin-wall pipe for this project. This was the first large-diameter seamless to be manufactured and used. Construction progress was greater than the seamless mill capacity. This resulted in the use of electric resistance-welded plate pipe to supplement the seamless. The specified yield strength of this pipe varied from 35,000 to 37,000 psi.

Presented at Pipe Line Contractors Association convention, January 12-14, Miami. R. G. Strong retired last year as vice president of Natural Gas Pipeline Co. of America.

Since 1930 there has been a gradual increase in the physical and chemical properties of line pipe. In 1941, 26-in. pipe was laid with a 0.250-in-wall, and a minimum yield strength of 52,000 psi. I can recall that an engineer for one of the long-distance gas-transmission companies informed me, in a pipeliner's language, that no 26-in., quarter-inch-wall pipe would be laid over or under his system. Suffice to say we did lay the thin-wall pipe under his lines. This is mentioned only to illustrate the reluctance of some people to accept advances and improvements. Incidentally, it can be mentioned that subsequently this same company has laid many miles of thin-wall pipe.

During the past few years several hundred miles of 30-in., X52 pipe, has been laid for oil and gas transmission. A gas-transmission company has recently completed the construction of about 500 miles of 36-in. X52 pipe. This was done in record time with no particular difficulty so far as construction techniques were concerned. Progress averaged 0.85 mile per working day. The contractors responsible are to be highly commended.

X60 pipe next . . . We are presently entering an era of increased yield strengths. Now available is X56 pipe which means a minimum yield strength of 56,000 psi. Consideration is being given to low-alloy high-strength pipe in grades X60 and higher and to pipe sizes of 40-in. and larger.

Where do we stop? Nobody knows!

FOR SEALING THE UNUSUAL . . .
DURA SEAL
. . . provides mechanical sealing for the widest range of pressures, temperatures and speeds
Technical information on request — write DURAMETALLIC CORP., Kalamazoo, Michigan

Says Maintenance Foreman of large gas processing plant.

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For 3½ years, users tested this new valve in the hardest services that could be found.

Now, W-K-M offers it to you as a **service-proved** new product, a new product with no bugs, a typical example of W-K-M's leadership in design, production and service.

This valve will deliver promised performance; you can specify it with complete confidence in its efficiency, economy, ease of operation and maintenance.

You should know more about it.

Write for Catalog 1000 for complete information.

AVAILABLE in carbon steel (ASA 150 lb., 300 lb.), and semi-steel (200 lb. WOG, 400 lb. WOG); sizes range from ½" through 6". Also ASA 600 lb., sizes ½, ¾ and 1".

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This is representative of progress and the result of engineering ingenuity and the ever-present desire to economically improve these things which are used for industrial expansion and domestic convenience. It is the American way of life.

We are presently familiar with the terms of yield and tensile strength, carbon and manganese. With the advances now being made in pipe manufacture the following terms will become more commonplace; impact tests, notch sensitivity, transition temperatures, and preheating.

Because of these improvements it becomes increasingly important to eliminate and avoid all defects in pipe. The pipe manufacturer has been severely and at times unfairly criticized for failure to accept the importance of inspection and nondestructive testing or other means for locating defects. While some of this is true, the responsibility does not rest entirely with the manufacturer. It is equally important that the user company and its inspectors be fully qualified to locate and interpret defects.

Contractor responsibility . . . The pipeline contractor also has an equal share in this responsibility. Many times perfectly good pipe has been damaged by equipment and permitted to remain in a pipeline system by incompetent inspection and careless contractor supervisors. This business of building pipelines is a cooperative enterprise in which all parties are equally responsible. Improved pipe is not the final answer.

It has been my observation that we need better trained and experienced inspectors if we expect to improve the quality of our pipelines, and this, likewise, is true for all men responsible for the construction of pipelines. Specifically, we need well-organized and managed schools to provide the necessary personnel training for this very important function.

As we go to higher physical and chemical properties in our pipe we are immediately faced with the question of weldability and bendability. We also can't ignore the necessity for new and improved construction equipment and new laying techniques.

A recent survey reports that, in order to met the petroleum-transportation needs through 1965, the following pipeline construction will be required: 56,000 miles of gas-transmission lines, 20,000 miles of crude lines, and 22,000 miles of products lines.

Pipeline contractors should initiate a program of testing and research to develop in advance the techniques that will be required to construct these high-yield large-diameter pipelines in the future.

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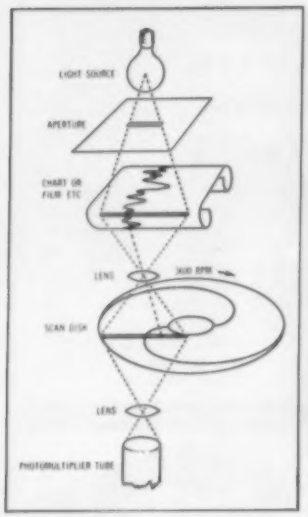
This week's SHOWCASE features . . .



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. . . automatically and eliminates time-consuming manual reduction of data. Strip or circular charts, film, or photographic traces are scanned by the automatic chart reader.

The instrument produces a pulse-width modulated signal proportional to the ordinate of the trace as the chart drive moves the chart past the scanner. Optional accessories convert this signal to digital, analog, or mechanical outputs. Other optional computing units perform operations on the output such as scale change, integration, or multiplication,

The output can be stored on punched cards or tape, magnetic tape, or displayed on automatic printers. Nominal scan rate is 7,200 times a minute. Accuracy is ± 0.1% of full scale. **Write or call: Geotechnical Corp., P. O. Box 28277, Dallas 28, for details on automatic chart reader.**

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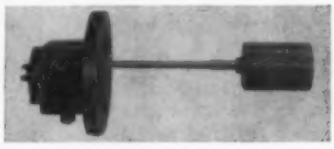

Float switch for level control

. . . has been developed that offers a number of potential uses. It can be used to give a high or low-level alarm, interface level control, automatic pumpup or pumpdown, or precision volume batching. It can not only be used to sound alarms but also to flash signal lights, start or stop fluid-transfer pumps, or to operate control valves.

The Mic-O-Flex unit consists of a hollow stainless-steel flexure tube and a pilot rod. The pilot rod passes through the flexure tube. The tube and the rod are connected together at the float end. On the opposite end, the flexure tube is securely fastened. This allows the pilot rod to move freely with the action of the float and actuate the switch. The float is made of solid Synthane disks.

Pressure rating of the float switch is 1,000 psig. Its temperature rating is 275° F. But a unit with a rating of 500° F. is obtainable. The switch housing is explosionproof and has two ½-in. NPT conduit openings. **Write or call: Instruments, Inc., P. O. Box 556, Tulsa, for details on Mic-O-Flex float control.**

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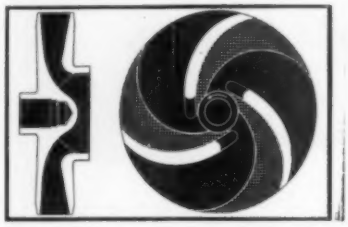

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The result is that a vacuum is formed. Any gases or vapors present fill this vacuum and are conducted out of the pump without interferring with liquid flow. This feature can be valuable as the pump need not be stopped or slowed down for reprimming.

The pump comes in sizes from 2 to 7½ hp. Discharge-connection diameters range from 1½ to 3 in. and are threaded. **Write or call: Ingersoll-Rand Co., Eleven Broadway, New York 4, for Form 70021.**

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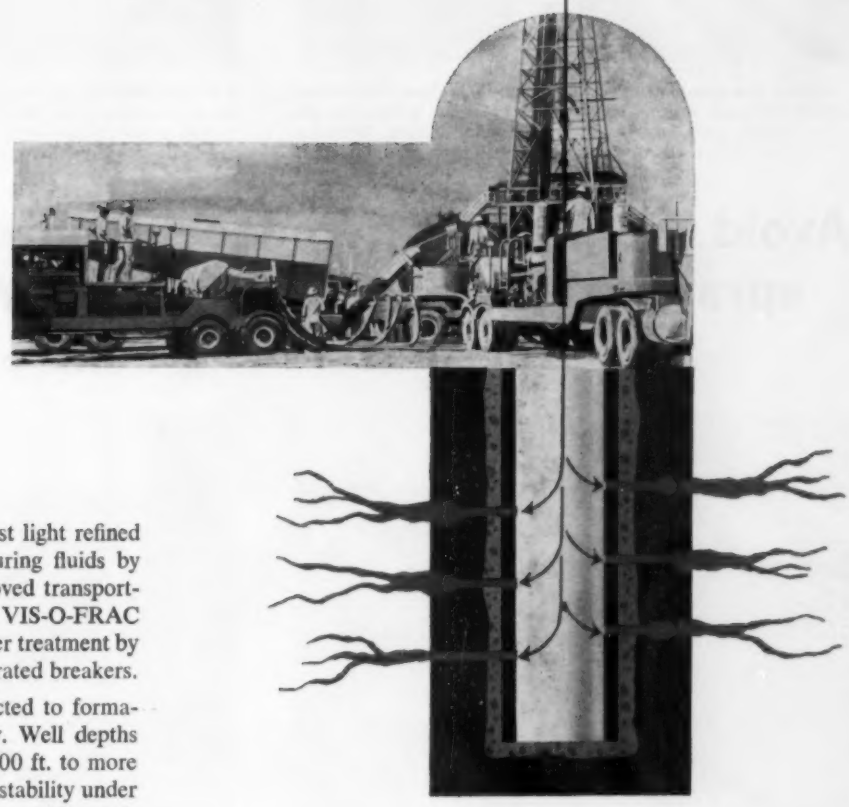

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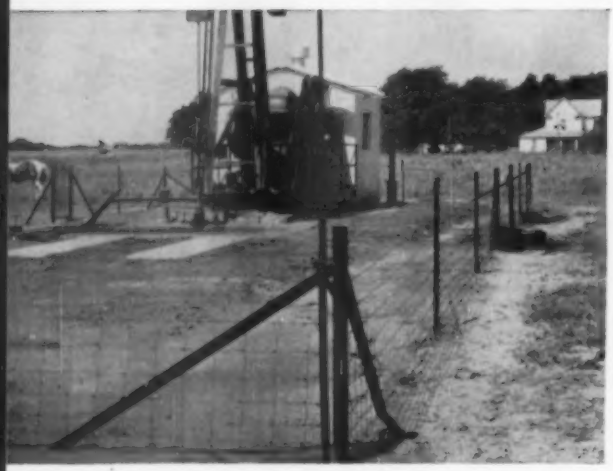
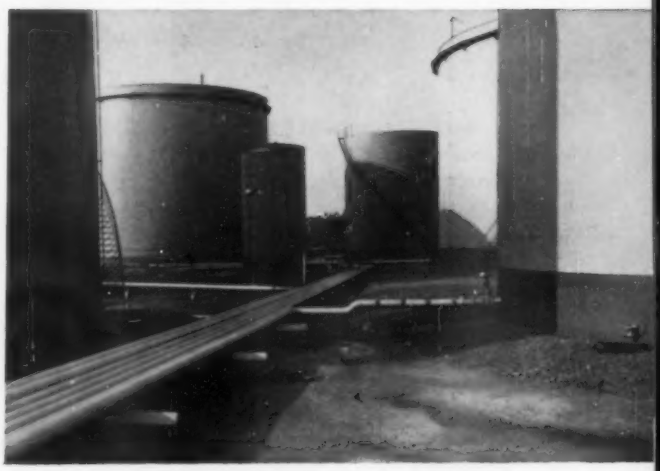
• Note the complete control of fire-hazardous vegetation with "Telvar" around these pipelines of the Tidewater Oil Co., which pass largely through a marshy area. Without "Telvar", weed control would have required costly hand labor.

• In this refinery of the Cities Service Oil Co., "Telvar" applied in May kept area weed-free entire season. In the oil industry, fire hazards and maintenance problems are greatly reduced by weed control with "Telvar" and "Karmex".

Avoid fire hazards...reduce maintenance costs spray just once with a Du Pont Weed Killer for season-long control



• "Telvar" was applied around this producing well of the Phillips Petroleum Co. in April, and this photo was taken five months later. "Telvar" and "Karmex" are non-volatile, non-corrosive, non-flammable . . . can be applied in producing fields without damage to property or hazard to livestock.



• Note the thorough job of controlling vegetation with "Telvar" around these tanks and pipes. Weeds and grasses can feed fires, make maintenance difficult, and the moisture they hold can cause corrosion. "Telvar" and "Karmex" control unwanted vegetation easily and economically.

Now you can eliminate weeds and grasses that create fire hazards and make maintenance difficult. Just one application of Du Pont "Telvar" monuron or "Karmex" diuron weed killer controls weeds for a season or longer.

"Telvar" and "Karmex" kill weeds through the roots . . . remain in the soil to provide residual action. Easy to handle, economical to use. Be sure to specify "Telvar" or "Karmex" for long-term weed control.

On all chemicals, always follow label instructions and warnings carefully

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Relief valve for ammonia service

. . . is designed to eliminate the need to shut down tanks to remove relief valves for testing or replacement. The manifold consists of three relief valves. Any one can be removed while a tank is under pressure. The remaining two valves provide enough relief capacity for up to a 30,000-gal. anhydrous ammonia tank.

The valves are removed by positioning a revolving disk under the valve to be removed. Positioning is done by a handwheel with numbers that correspond to numbers on the relief valves.

The valves are made of forged aluminum. They have removable steel manifold seat rings. Port diameter is 4 in. **Write or call: Bastian-Blessing Co., 4201 West Peterson Avenue, Chicago 46, for details on safety relief valves for ammonia service.**

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Pneumatic-piston valve operator

. . . is designed for use where a strong force and a fast stroking speed are needed. Its enclosed positioner mounted on the cylinder is suitable for a wide range of instrument signals. Supply pressures to 150 psi. can be used, creating stem forces from 1,500 to 12,000 lb. Stroking speeds range up to 1.5 in. a second.

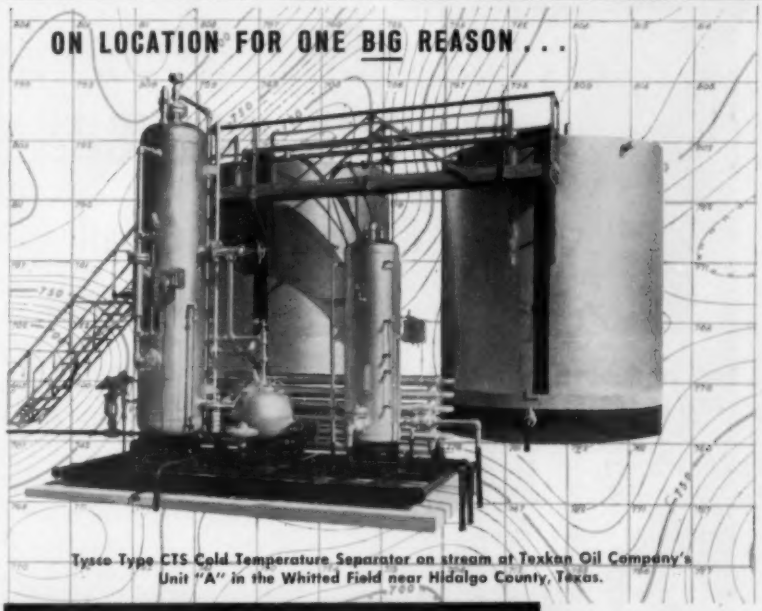
Easily reversible in the field, the unit has a weatherproof housing over the positioner and pressure gages. Available accessories include: (1) manual side-mounted handjack, (2) hydraulic snubber, (3) spring-closed or spring-opened action, and (4) on-off operation. **Write or call: Fisher Governor Co., Marshalltown, Iowa, for Bulletin E-59.**

Aluminum pipe weight is reduced

. . . while its burst, tension, and bending strength is made uniform along the pipe's length after welding of joints. The Unistrength seamless pipe is obtainable in 40-ft. lengths in two alloys with Schedule 40 wall thickness at the ends. Standard aluminum fittings and flanges can be used with it.

Additional combinations of wall thicknesses can be obtained for other joining methods. By decreasing the wall thickness of weldable, heat-treated aluminum alloys, except at the

ON LOCATION FOR ONE BIG REASON . . .



Tysco Type CTS Cold Temperature Separator on stream at Texkan Oil Company's Unit "A" in the Whitted Field near Hidalgo County, Texas.

IT INCREASES HYDROCARBON RECOVERY!

Before putting their Unit "A" on stream, Texkan Oil Company, Dallas, Texas, wanted to be sure of getting maximum hydrocarbon recovery. After an investigation of many good cold temperature separators, they chose a Tysco Type CTS Cold Temperature Separator. The one unit that *gives* maximum hydrocarbon recovery.

The Tysco CTS Cold Temperature Separator installed for Texkan has a 7 MMCFD capacity. This unit is increasing recovery from Texkan's gas-distillate wells by as much as 15 per cent by recovering products that would normally be lost in the sales gas. *And,* the Tysco Separator will pay itself out in a minimum of operating time.

But increased hydrocarbon recovery is only one reason for selecting Tysco oil and gas process equipment. Equipment dependability and service after installation are also big factors. When you specify Tysco you get all three! Maximum recovery – Dependable equipment performance – On-time service.

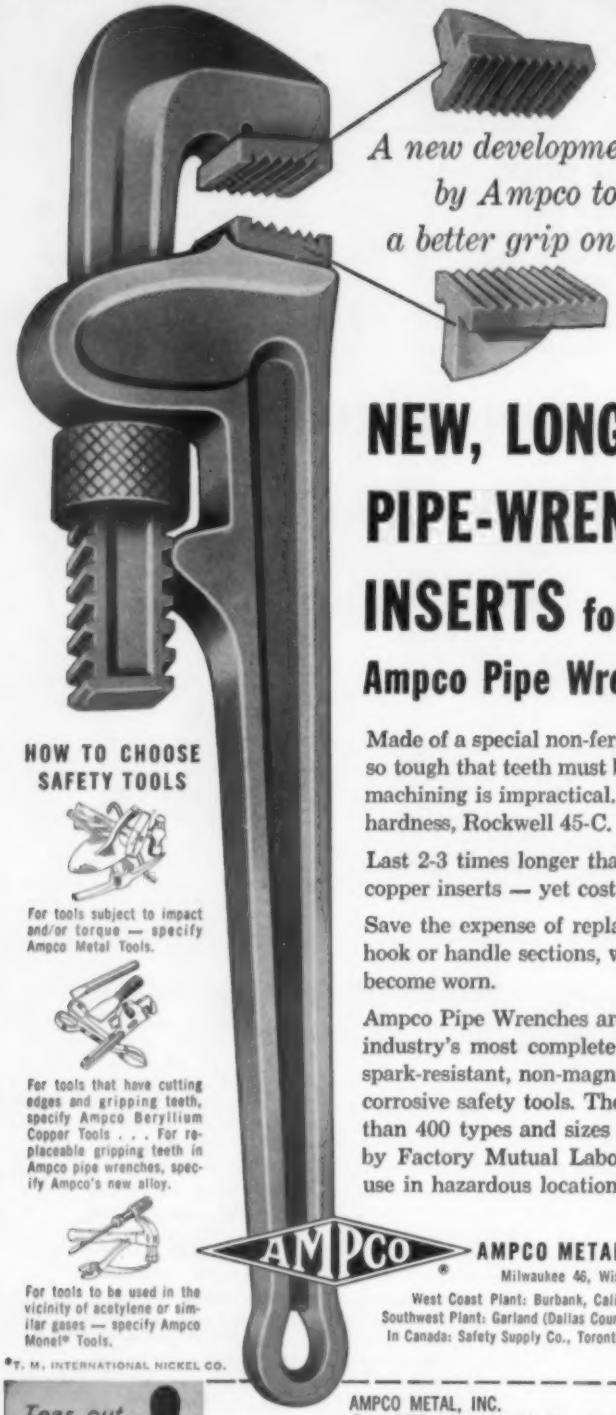
Find out the advantages of using Tysco process equipment for yourself. Consult with a Tysco Sales Engineer before you put your next well on stream; there's no obligation.

TYSCO TYSON SMITH CO. ONE OF THE SMITH INDUSTRIES

8000 Hempstead Highway • Houston, Texas

SERVING INDUSTRY WITH QUALITY PRODUCTS, DEPENDABLE SERVICE.

AMPCO PIPE WRENCHES MEET U. S. GOVERNMENT HEAVY-DUTY REQUIREMENTS



A new development by Ampco to give you a better grip on safety!

NEW, LONG-LIFE PIPE-WRENCH INSERTS for all Ampco Pipe Wrenches

Made of a special non-ferrous alloy so tough that teeth must be cast in — machining is impractical. Minimum hardness, Rockwell 45-C.

Last 2-3 times longer than beryllium copper inserts — yet cost no more!

Save the expense of replacing entire hook or handle sections, when jaws become worn.

Ampco Pipe Wrenches are part of the industry's most complete line of spark-resistant, non-magnetic, non-corrosive safety tools. There are more than 400 types and sizes approved by Factory Mutual Laboratories for use in hazardous locations.

HOW TO CHOOSE SAFETY TOOLS

For tools subject to impact and/or torque — specify Ampco Metal Tools.

For tools that have cutting edges and gripping teeth, specify Ampco Beryllium Copper Tools . . . For replaceable gripping teeth in Ampco pipe wrenches, specify Ampco's new alloy.

For tools to be used in the vicinity of acetylene or similar gases — specify Ampco Monel® Tools.

®T. M. INTERNATIONAL NICKEL CO.

AMPCO® AMPCO METAL, INC.
Milwaukee 46, Wisconsin
West Coast Plant: Burbank, California
Southwest Plant: Garland (Dallas County), Texas
In Canada: Safety Supply Co., Toronto, Ontario

T-31

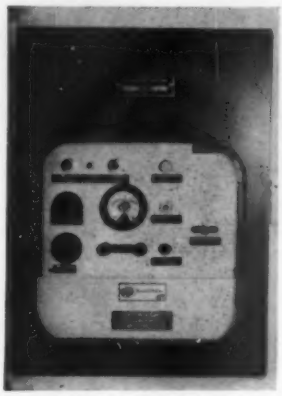
Tear out coupon and mail today for free copy of Catalog ST-10!

AMPCO METAL, INC.
Dept. 168B, Milwaukee 46, Wisconsin
Send me Catalog ST-10; also further facts on the new pipe-wrench inserts.

Name_____
Title_____
Company_____
Address_____
City_____ Zone_____ State_____

joints where the heat of welding lowers strength, the maker is able to achieve a considerable reduction in pipe weight while keeping the strength along the pipe uniform after welding. **Write or call: Aluminum Co. of America, 761 Alcoa Building, Pittsburgh 19, for details on Unistrength pipe.**

●



B.s. and w. monitor circuit is simple

. . . and the monitor is easy to operate and calibrate in the field. A compact simulator is available for calibration checking. Licensed and manufactured under Gulf Research & Development Co. patents, the monitor meets the API Code for b.s. and w. monitoring.

As a quality-control instrument, the monitor is sensitive to change of the dielectric constant of a fluid caused by contamination by other substances. By detecting changes in the b.s. and w. percentage of the liquid passing through the probe, it continuously evaluates the quality of crude oil delivered to a pipeline. Contamination exceeding the b.s. and w. requirement can be automatically rerouted for further treatment.

Range of the maker's standard instrument is 0 to 3%. But other ranges can be obtained as well as special recording instruments. **Write or call: Garrett Oil Tools, Inc., P. O. Box 2427, Longview, Tex., for details on b.s. and w. monitor.**

●

Chemical reduces steel corrosion

. . . in water systems and effects nearly complete control of microorganisms in cooling water. The RD-2873-P chemical is a catonic surface-active agent and is a 40%-active isopropanol solution that is soluble in water, benzene, hexylene glycol, and carbon tetrachloride. Its pour point is less than 0° F.

Aqueous solutions of the chemical

. . . BECAUSE quality counts in the long run

1. Seamless and weldless construction.
2. Made from new, full weight material.
3. Uniform length and shape.
4. Accurate threads — beveled for easy starting.
5. Square faced ends.
6. Chamfered inside edges.
7. Ample tong space.
8. Rust-Proof ZINCOTING, for threads and body, inside and out.
9. Attractive labeling for size, thread and weight.
10. Color coded for easy thread identification.
11. Packaged for shipping and storing.

LARKIN FORGED STEEL FITTINGS

ARE RECOGNIZED AS THE STANDARD IN THE INDUSTRY

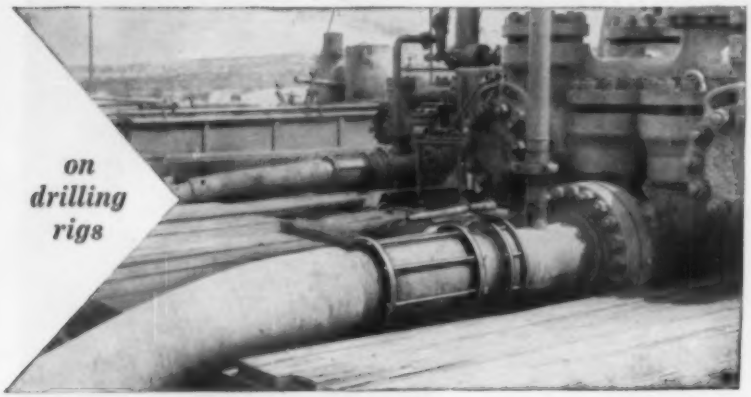
LARKIN PACKER COMPANY, INC.
WAXAHACHIE, TEXAS

LARKIN
...Through Your Supply Store

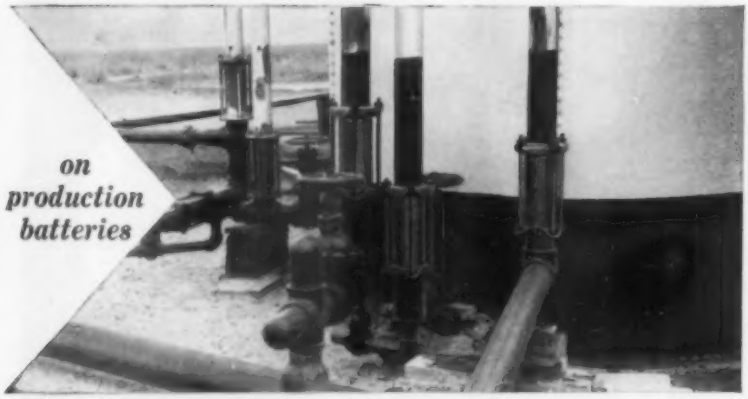
PESA

LARKIN LEADERSHIP HAS BEEN EARNED BY YEARS OF DEPENDABLE PERFORMANCE

Dresser® Couplings—



fast, vibration proof...



safe, permanent joints!

Dresser Couplings are easily installed . . . only two man-minutes per bolt with a simple hand wrench. The specially compounded Dresser Gasket provides the essential "give and take" to absorb vibration, settlement, and other stresses that might cause damage. It also allows up to 4° pipe deflection at every joint and still maintains a permanent, bottle-tight seal. Eases of take-down and re-usability of Dresser Couplings are a tremendous asset where you may need to add new pumps, valves or lines. Send for Dresser Catalog No. 531. It contains more detailed information and complete specifications on *all* Dresser Couplings, Fittings and Pipe Repair Products.

• GET THEM FROM YOUR LOCAL OIL FIELD SUPPLY STORE

Bradford, Pennsylvania
Chicago
Houston
Philadelphia
New York
S. San Francisco
Toronto & Calgary

DRESSER
MANUFACTURING DIVISION

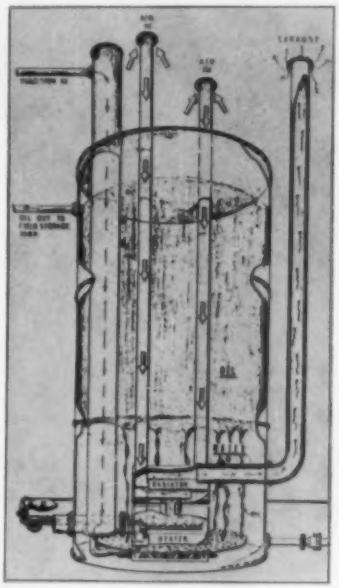
ONE OF THE DRESSER INDUSTRIES

SHOWCASE . . .

New Equipment

produce large quantities of a stable foam. Hard water, high salt concentrations, and varied solution temperatures show only slight effect on the volume and stability of the foam. **Write or call: Armour & Co., Chemical Div., 1355 West Thirty-First Street, Chicago 9, for details on RD-2873-P.**

•



Submerged heater for oil treating

. . . by either the gun-barrel or the heater-treater method has been developed that promises increased heating efficiency as compared to older heating methods. The heater is gas-fired and supplies constantly controlled heat within a 4° tolerance at any preset temperature, the maker reports. Weather conditions are not a factor in the unit's efficiency.

It is designed so the flame is sealed inside the fire chamber beyond the possibility of contact with outside flammables. Intake and exhaust openings are at least 25 ft. from the heater body. The openings are engineered to allow air and gas to enter only when the burner is operating.

For high heat transfer, liquid to be heated completely surrounds the heater. The burner performs at high efficiency even with up to 200 ft. of intake and exhaust pipe attached. Capacities range from 30,000 to 1.5 M.M.B.t.u. input. The heater can be installed in present gun-barrel or heater-treaters or in new tanks. **Write or call: Space Corp., Garland, Tex., for details on submerged oil heater.**

IT TAKES A SPECIAL KIND OF BANKER

The oil man who walks through the door of National Bank of Tulsa knows he has come to the right bank. Here, at NBT, the oil man finds other men who speak his language, men who can evaluate his problem in the light of their own active experience in the industry. The bank that best understands your operation will unquestionably be of most help to you. Many oil men have found this to be true at National Bank of Tulsa. We believe you will, too.

NATIONAL BANK OF TULSA

NBT

NATIONAL BANK OF TULSA

OIL BANK OF AMERICA TULSA, OKLAHOMA

Member Federal Deposit Insurance Corporation

Your *FISHER/MAN* offers you

SPEEDY DELIVERY

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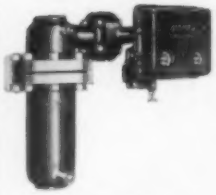
Where you can shop by phone, wire or TWX

Type 657-A with 3500 positioner

Type 4150 and 4160 Wizard II Pressure Controllers



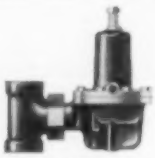
Series 2500-249 and 2500-259B Level-Trols

Type 95-H Pressure Reducing Valve

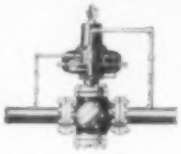
Type 630 "Big Joe" Field Regulator

Series 99 Multi-Purpose Gas Regulators

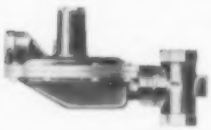
Type 655-A Pressure Regulator



Series 620 and 621 Farm Tap Regulators

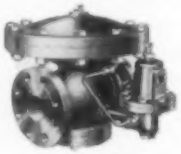


Series 298T Gas Regulators



Series S100 and 730 Service Regulators

Series 67FR Combination Filter-Regulator



Type 92B Pilot Operated Steam Reducing Valve

This "supermarket" availability of Fisher Control Valves and Controllers makes your delivery problems a thing of the past. Fisher keeps a stock of the equipment at left always on hand ready to ship to you at hourly notice. This means emergency requirements are met without costly delivery delays. This stock of control equipment includes all the most popular types in standard sizes.

In addition to the large factory stock, the Fisher offices in the column to the right which are starred carry a big selection of Fisher equipment in inventory to assist you.

Fisher constantly reviews the stock carried in the Supermarket and adds new items from time to time when your needs indicate.

Phone, wire or TWX (Marshalltown 578 or 579) and Fisher will have your order en route in a matter of hours, Saturday and Sunday excepted.

IF IT FLOWS THROUGH PIPE ANYWHERE IN THE WORLD... CHANCES ARE IT'S CONTROLLED BY...

FISHER GOVERNOR COMPANY

Marshalltown, Iowa / Woodstock, Ontario / London, England

CONTINENTAL EQUIPMENT CO. DIVISION, Coraopolis, Pennsylvania

FISHER

SINCE 1880

Now, for emergency needs contact FISHER or the representatives listed below.

*AMARILLO
Vinson Supply Company
*ATLANTA
J. M. Smither & Company
BALTIMORE
The Rhodes Controls Company
BIRMINGHAM
Joseph W. Eshelman & Company
BOSTON
Clarence B. Petty & Company
BUFFALO
W. J. Sommers Company
*CALGARY-EDMONTON
Barber Engineering & Supply Company
CARACAS, VENEZUELA
Sinclair Spence
*CHARLOTTE
Robert E. Mason & Company
CHICAGO
General Meters & Controls Company
CINCINNATI
H. T. Porter Company
*CLEVELAND
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*DALLAS
Vinson Supply Company
*DENVER
Joy & Cox, Inc.
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DuBois-Webb Company
*HOUSTON-CORPUS CHRISTI
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MONTREAL
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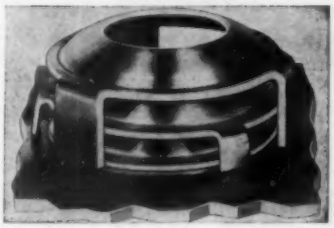
Mechanical Valve & Engineering Spec.

SHOWCASE . . .

New Equipment



Fractionation tray efficiency is high

. . . over a range from low vapor rates (within 10% of flood point) up to moderate rates at a turndown ratio (ratio of maximum to minimum vapor rates at which a high efficiency is maintained) of at least 9.0. To maintain this efficiency, the tray is designed around a valve unit that acts as a variable orifice to provide multistaging of the slot area through the various rates of vapor flow.

According to the maker, the ballast unit permits uniform distribution of vapor through the liquid across the tray throughout a wide range of capacity, optimum vapor velocity through the liquid over a wide range of flow rates, and a large turndown ratio by progressive staging of the vapor opening from low to increasingly high flow rates. The unit establishes a primary pressure drop at the vapor-liquid interface to obtain maximum tray efficiency. **Write or call: Fritz W. Glitsch & Sons, Inc., Box 6227, Dallas, for details on ballast tray.**

●

Trailer-mounted drilling rig

. . . for drilling large or deep water wells, deep exploration holes, or wells for shallow production is rated for depths to 4,000 ft. The Model 60 unit mounts on a frame trailer with tandem rear axle.

DESIGNED FOR . . . TESTED AND PROVEN IN THE OIL FIELDS

FIELDMASTER BALL BEARING MOTORS

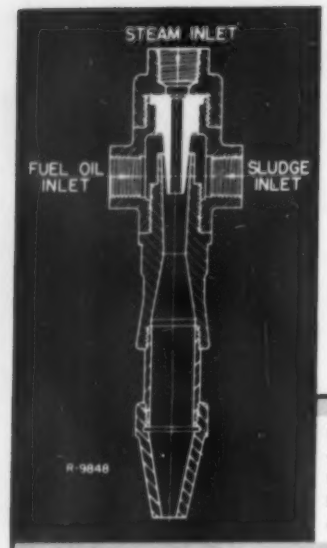
- VERMIN PROOF
- DRIP PROOF
- CORROSION RESISTANT
- MOISTURE PROOF
- FORCED AIR COOLED

Yes . . . all these features are combined in Fieldmaster Ball Bearing Motors to make them the leading power units in the oil country. Naturally there's a type and H.P. especially suited to fit your specific requirements.

Contact us for complete information on any motor requirement.

BETHLEHEM STEEL COMPANY
SUPPLY DIVISION
TULSA, OKLAHOMA

Manufactured by
VALLEY ELECTRIC CORP.
ST. LOUIS 8, MISSOURI



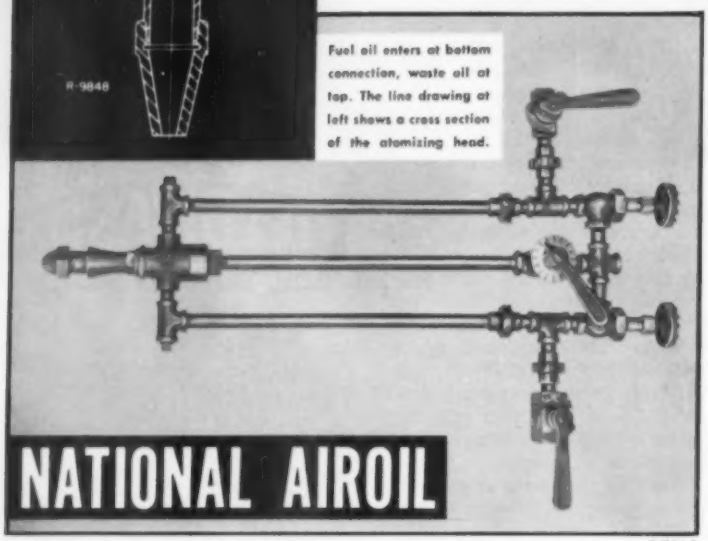
For

CLEAN BURNING

of

SLUDGES AND OIL WASTES

Fuel oil enters at bottom connection, waste oil at top. The line drawing at left shows a cross section of the atomizing head.



NATIONAL AIROIL

P-706-1

TYPE S.A.D. BURNERS

To Atomize by; Steam, Compressed Air or any Fuel Gas under sufficient pressure.

National Airoil Burner Company recommends their patented S. A. D. Burner to improve the disposal of sludges and waste oils in furnaces or open pits in Oil Refineries, Chemical and Industrial Plants.

Type S. A. D. Oil Burners are especially designed for burning acid or caustic oils and their sludges, tank bottoms or semi-liquids of either combustible or semi-combustible nature, the disposal of which generally presents a nuisance problem.

Type S. A. D. Oil Burners will help to quickly burn these materials by admixing them with any needed proportion of regular fuel oil within the burner body and then spraying the emulsified mixture into the furnace.

Type S. A. D. Oil Burners are made standard in sizes 40, 80, and 120 U. S. gallons per hour. Larger sizes special.

Write now, on your business letterhead for Bulletin No. 21, which contains complete details, specifications and illustrations of the Type S. A. D. Oil Burners.

National Airoil

BURNER COMPANY, INC.

Main Office & Factory: **1226 EAST SEDGLEY AVE., PHILADELPHIA 34, PA.**

SOUTHWESTERN DIVISION: 2512 SOUTH BOULEVARD, HOUSTON 6, TEXAS

SHOWCASE . . .

New Equipment

Such units as the mast, engines, pump, draw works, rotary table, and fuel tank are individually mounted. The one-section derrick has a height of 48 ft. above the rotary table. This permits either range-one or range-two drill pipe to be pulled in singles.

With an optional 10-ft. section, range-one pipe can be pulled in doubles. A diesel engine powers the draw works and rotary table. It is equipped with a torque converter and three-speed powershift transmission. Another diesel engine powers the mud pump through a V-belt drive. Thus pump speed can be changed without changing drill speed.

Drilling controls are conveniently placed on the side of the draw works. Air controls are used. All gages are located for easy visibility. **Write or call: Franks Machine Co., P. O. Box 1712, Enid, Okla., for details on Model 60 drill.**

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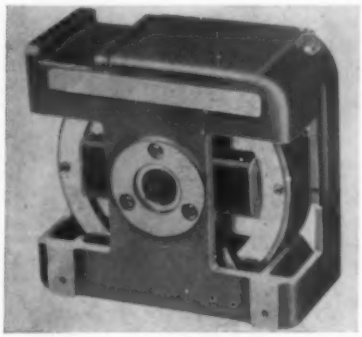


Encoder converts rotary motion

. . . to a coded electrical output suitable for long-distance transmission and logging. Simple in construction and operation, the Series 2100 encoder uses a metal-clad plastic disk with readout brushes which are not normally in contact to obtain a coded output.

When a readout switch is closed, it puts the brushes in contact with concentric, printed-circuit tracks on the disk and then closes another switch that energizes the disk and contacts.

The device is expected to prove valuable for transmitting and logging temperature and pressure readings. It can be used in any situation involving a shaft whose rotation can be stopped for short intervals. **Write or call: Norwood Controls, Norwood, Mass., for details on Series 2100 encoder.**

with Davison Catalysts

Your stack carries away regeneration gases —not catalyst—when you put Davison in your unit. Here's why:

With Davison Catalysts you get the lowest amount of unretainable fines.

With Davison Catalysts you get lower attrition. The lower breakdown rate of Davison Catalysts means you get the fines you need without light particles escaping up the stack.

The reason: *balanced density.* There's a Davison Catalyst to suit your application. Write Department 4012, today for Product Service Bulletin No. 59-101.

W.R. GRACE & CO.
DAVISON CHEMICAL DIVISION
BALTIMORE 3, MARYLAND

You are invited to attend the

AMERICAN LAFRANCE

1959 INDUSTRIAL Fire School

Snuffing a gasoline fire with Carbon Dioxide

There are frequent question-and answer sessions

Fog or Foamite . . . everyone has his chance

Learning about dry chemical, by using it

Here's a timely opportunity to further your knowledge of the latest in equipment and techniques in fighting *industrial* fires. Attend the 1959 session, American LaFrance Industrial Fire School, to be held at our experimental testing grounds near our plant in Elmira, N. Y.

PARTICIPATE IN DEMONSTRATIONS

You will use all types of portable extinguishers on live fires . . . participate in class discussions ranging from fundamental elements of fire protection to the most up-to-date methods of equipment use. You will also be instructed and participate in demonstrations of fixed (piped) carbon dioxide, chemical foam and airfoam systems.

Bring your special problems with you. Time is provided for individual discussions of *your* plant fire protection situation. Opening date for the first 3-day session is May 12th. Attendance is free, lunches are provided.

Many plant fire departments tell us our school is the finest of its kind anywhere. We'd be happy to have you join us. You can get full information and reservation blanks from our Representative, or, write for Brochure No. AD20005. We suggest you move fast. Classes are limited to 25 persons each session.

AMERICAN LAFRANCE

DIVISION OF STERLING PRECISION CORPORATION

ELMIRA, N.Y., U.S.A.

In Canada, LaFrance Fire Engine and Foamite, Ltd., Toronto, Ont.

SHOWCASE . . .

New Literature

Pump handles liquids to 70,000

. . . g.p.m., as described in new Bulletin B-1300 now accessible. The bulletin contains cutaway sectional views and cross-section drawings which describe the pump in detail. The bulletin gives complete dimensional and performance data, and includes a detailed page of sample specifications. **Write or call: Peerless Pump Div., Food Machinery & Chemical Corp., 301 West Avenue 26, Los Angeles 31, for Bulletin B-1300.**

Accessories for process-stream

. . . analyzers are described in new two-page Bulletin 1854. Items illustrated include a vaporizer regulator, gas scrubber, water coalescer, and sample and bypass filters. The bulletin gives applications and detailed engineering drawings of each accessory. **Write or call: Analytical and Control Instrument Div., Consolidated Electrodynamics Corp., 300 North Sierra Madre Villa, Pasadena, Calif., for Bulletin 1854.**

Power-transmission equipment

. . . is detailed in a new four-page bulletin. It contains a description of the major features of: (1) speed-reduction drives; (2) screw-conveyor drives; (3) adjustable-speed drives, both standard and wide range; (4) motor bases; and (5) conveyor and split pulleys. The bulletin lists a complete range of sizes for each piece of equipment. **Write or call: American Pulley Co., 4214 Wissahickon Avenue, Philadelphia 29, for Power-Transmission Equipment bulletin.**

Pipeline-systems control concept

. . . is described in new four-page Bulletin 1018. It details various methods of determining and providing the type of centralized-control systems required to meet present and future needs of the oil and gas industries safely, reliably, and economically. **Write or call: Advertising Dept., Union Switch & Signal Div., Westinghouse Air Brake Co., Swissvale, Pa., for Bulletin 1018.**

Plug-valve-actuator brochure

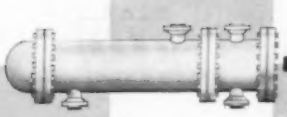
. . . contains 22 pages of data, specifications, dimensions, torque, information, and revised and expanded

"SELECTIVE" SERVICE: aromatics to aspirin

Benzene and Toluene currently produced at Cosden Petroleum Corporation's Big Spring, Texas refinery, so greatly exceed the purity requirements of the ASTM "Nitration Grade" specifications, that these products are now being used directly in the manufacture of pharmaceuticals such as aspirin and cortisone.

As integral parts of the UOP Rexforming® and Udex® units at Big Spring, Western heat exchangers perform an important service in the conservation and transfer of heat during the selective extraction of these aromatic hydrocarbons.

Heat Transfer requirements for petrochemical processes present a worthwhile challenge, and Western will continue to expand its sphere of influence in the petroleum industry's growing importance to chemical consumers.



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WESTERN SUPPLY COMPANY

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STRAHMAN VALVES, Inc.
16 Hudson St., New York 13, U.S.A.

selection tables. The publication should prove especially useful to plant design and construction engineers in selecting the correct-size actuator for plug valves up to 12 in. **Write or call: Pantex Mfg. Corp., P. O. Box 660, Pawtucket, R. I., for Plug-Valve-Actuator Blue Book.**

Acid-resistant valve alloy

. . . called Aloyco 20 is outlined in new Bulletin 8. The alloy is a special austenitic stainless steel recommended for valves handling sulfuric acid and other severely corrosive liquids. Cross-sectional views show the available valve designs. A graph illustrates the strengths and temperatures of sulfuric acid in which the alloy may be used. **Write or call: Alloy Steel Products Co., Inc., Linden, N. J., for Bulletin 8.**

1959-1960 oil-field equipment

. . . catalog contains full descriptions, detailed engineering data, complete parts-price lists, and numerous illustrations of oil-field equipment. The 172-page catalog is strongly bound and printed throughout in large type on heavy stock. Copy is confined to essential information and every listed item is priced and identified by an individual-part number. Drawings assist in quick identification of replacement parts. The catalog outlines setting and removal procedures and provides a surface-setting stroke table for each type of packer offered. **Write or call: Guiberson Corp., P. O. Box 1106, Dallas, for 1959 - 1960 Oil - Field Equipment catalog.**

Indicating-dial thermometers

. . . for temperature measurements between —40° and 1,000° F., are outlined in new 12-page Bulletin 205. The bulletin gives specifications for both direct and remote-reading types and contains information on four types of filling mediums, as well as thermometer-case sizes, materials, and styles. Tables give selection data and dimensions for cases, bulbs, and bulb connections. **Write or call: U. S. Gage Div., American Machine & Metals, Inc., Sellersville, Pa., for Bulletin 205.**

Engineering properties of Ni-Resist

. . . Ductile Irons is the title of a 28-page brochure containing the full story of this unique new cast metal that combines high strength and toughness with outstanding resistance to heat, wear, and corrosion. Tables and graphs explain mechanical and physical properties, erosion and corrosion

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(See ad on facing page)

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NEW YORK, Eastern Steam Specialty Co.
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OMAHA, Cardinal Supply & Mfg. Co.
ORANGE, Conn., Insulation Supply Co.
PHILADELPHIA, John F. Scanlan, Inc.
PHOENIX, Ariz., Kircher Asbestos & Rubber Co.
PITTSBURGH, Dravo Corp.
RALEIGH, N.C., Reynolds Aluminum Supply Co.
RAPID CITY, S. D., Robbins & Stearns Wholesale
RICHMOND, Va., Reynolds Aluminum Supply Co.
ROANOKE, Va., C. E. Thurston Co.
ROCKFORD, Ill., Mott Brothers Co.
SALT LAKE CITY, Bullough Asbestos Supply Co.
SAN ANTONIO, The Bracken Co.
SAN DIEGO, Western Fibrous Glass Products
SAN FRANCISCO, Western Fibrous Glass Products
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SEATTLE, Western Fibrous Glass Products
ST. LOUIS, Hollander & Co., Inc.
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ST. PAUL, Asbestos Products, Inc.
SULLIVAN, Ill., Lewie David, Inc.
TALLAHASSEE, Fla., Bakers, Inc.
TAMPA, Fla., Eagle Roofing & Art Metal Works, Inc.
TULSA, Okla., Ball Distributing & Engr. Co.
TUPELO, Miss., Paine Supply Co.
VANCOUVER, B. C., Fleck Brothers Limited
WASHINGTON, D. C., Walter E. Campbell Co.
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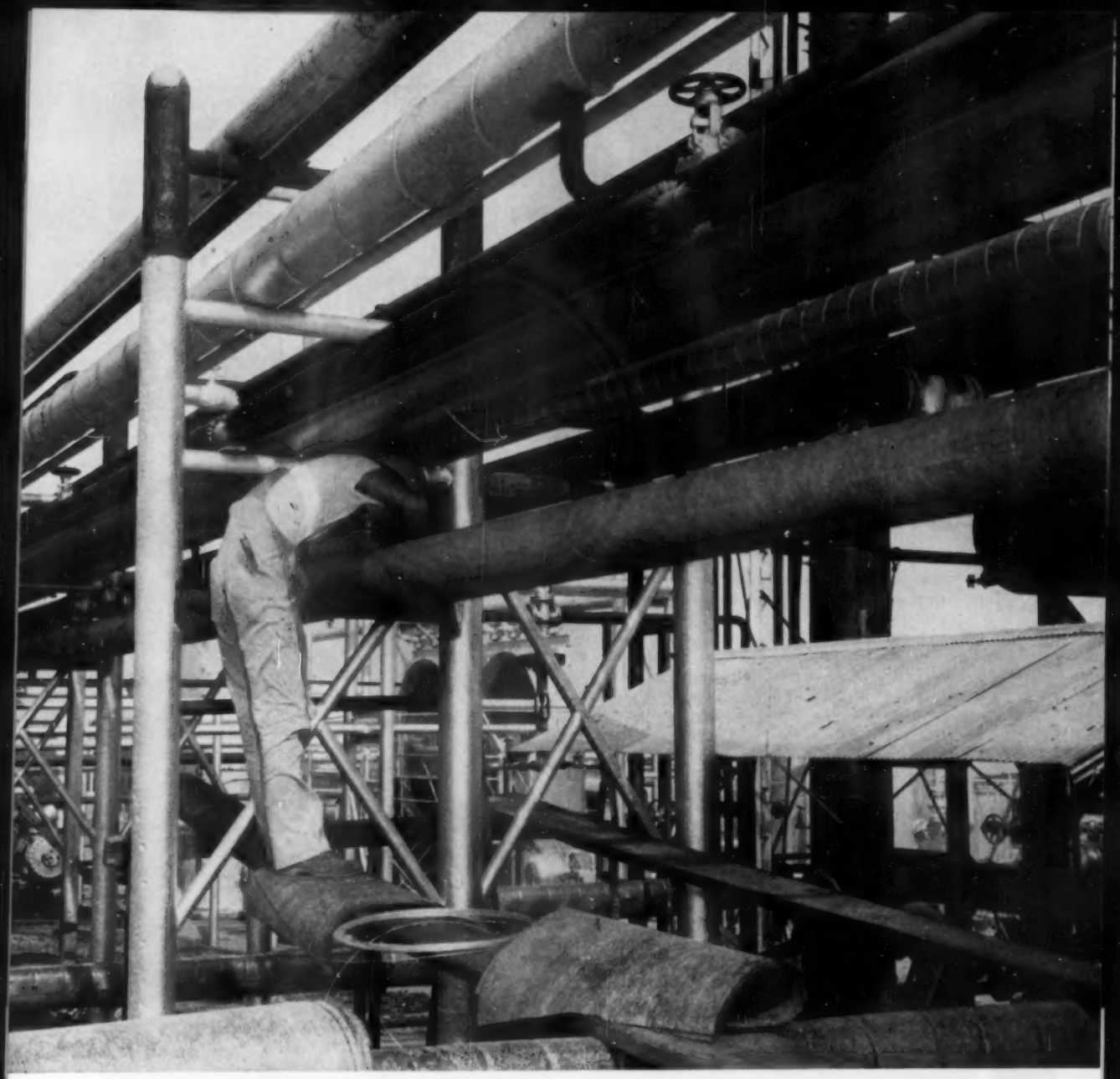

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Thermal and acoustical glass fiber insulations . . . Molded glass fiber pipe insulation
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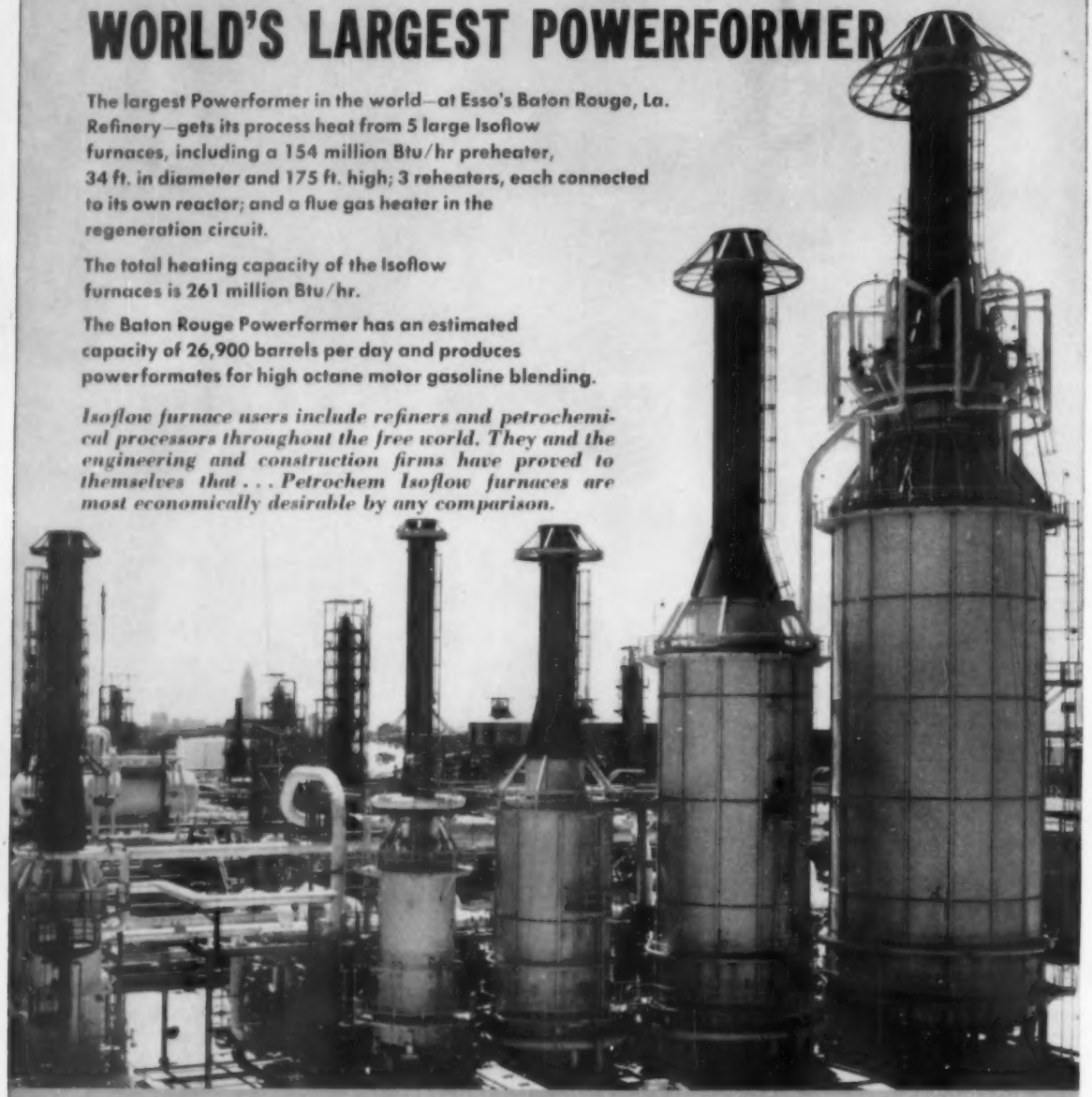

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resistance, and high-temperature strength. A special section points out numerous proven industrial applications of the irons. **Write or call: International Nickel Co., Inc., 67 Wall Street, New York City 5, for Engineering Properties of Ni-Resist Ductile Irons brochure.**

Cable drilling, casing,

. . . and fishing tools are illustrated in a new 76-page catalog. Each equipment item is accompanied by complete manufacture description and method of field use and maintenance. Tables of dimensions and weights are shown in both standard and metric measures. The catalog explains two methods of setting wire line in a socket, gives complete dimension tables of bit-blade sections, and includes instructions for dressing and tempering alloy or carbon-steel bits. A four-page section features a new hydraulic bit dresser. **Write or call: Acme Co., P. O. Box 860, Parkersburg, W. Va., for Cable Drilling, Casing, and Fishing Tools catalog.**

Packaged steam generators

. . . are outlined in new Bulletin PG-58-2 now available. The four-page publication gives features, standard and optional equipment, a capacity and dimension table, and cutaway drawings. It includes discussions of economizers, superheaters, combustion controls, and firing equipment. **Write or call: Foster Wheeler Corp., 666 Fifth Avenue, New York City 19, for Bulletin PG-58-2.**

Pipeline gate valves

. . . made of cast steel are detailed in new eight-page Bulletin G-582, which gives dimension drawings and figures for ASA Series 150, 300, 400, 600, and 900 valves. The valves are available in 2, 3, and 4-in. sizes throughout the series, and are manufactured with either flanged or welded ends. Welded ends are bored and machined to customer specifications. The bulletin gives design features which include patented rings that eliminate the need for lubrication, full-open conduit, double-seal metal-to-metal plus O rings, and nonwedging parallel-sided gate. **Write or call: Grove Valve & Regulator Co., 6509 Hollis Street, Oakland 8, Calif., for Bulletin G-582.**

Rust Index of the U. S.

. . . lists the different rates at which metal rusts for each of 523 cities throughout the country. Rates at which metal rusts vary from 3 to 15 years. **Write or call: Rust-Oleum Corp., 2799 Oakton Street, Evanston, Ill., for Rust Index.**

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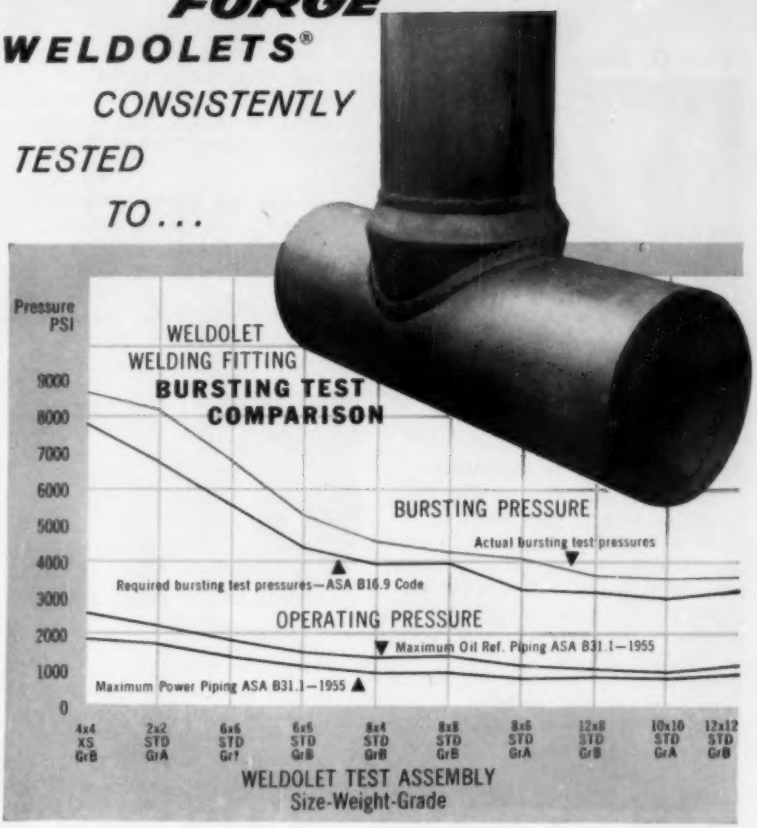
CONSISTENTLY TESTED TO . . .



. . . OVER
4½ TIMES MAX. OPERATING PRESSURE

"Shape of Reinforcement"—has been pioneered by Bonney for the past 20 years. The fact that shape is as important and even more important than area replacement for branch reinforcement is now gaining wide industry recognition. Even though Weldolets *do* have sufficient area replacement, the factor setting them apart from conventional lap type reinforcement is their SHAPE . . . Reinforcement close to the juncture—completely bonded homogeneous reinforcement avoiding cracks, fillet welds, and re-entrant corners—reinforcement tapering at the sides to prevent abrupt change in thickness where fitting joins header pipe.

Recent design improvements in the Weldolet line, based on extensive stress analysis tests, provide all these desirable "shape" factors. Specify and use Weldolets for all your full size and reducing branch connections. They are available in carbon steel and all alloys for any piping service.

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CARBON STEEL
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ALLOY
for all services

BONNEY FORGE and TOOL WORKS
ALLENTOWN, PENNSYLVANIA

Lester G. Evans is promoted

. . . to vice president in charge of sales of Axelson Division of U. S. Industries, Inc. He had been the division's general sales manager since November, 1957. Before coming to Axelson, Evans was vice president and general manager of All-Power Mfg. Co. of Montebello, Calif. Previously, he served as assistant to the president of Emsco Mfg. Co.

Garrett Oil Tools announces

. . . the consolidation of its West Texas and New Mexico sales districts.

T. R. Collins, who has been serving as New Mexico district manager, will be manager of the newly combined districts, with headquarters in Hobbs, N. M. The West Texas portion of the new district will still be handled through the Odessa, Tex., office, with J. W. Staples in charge.

W. K. Woodward, formerly West Texas district manager, has been named special sales engineer, concentrating on city sales in Garrett's Houston district.

Garrett also announced the transfer of William K. Holleron from Casper, Wyo., to Houston, where he will be supervisor of sales for the firm's milling and coring operations. Garrett is a division of U. S. Industries, Inc.

Infilco, Inc. announces

. . . a comprehensive plan for leasing water, sewage, and waste-treating equipment, with option to purchase. The plan can be applied to many types and sizes of equipment.

Tax deductions become an advantage in the case of industrial customers. Payments out of revenue or other sources of funds where this is practical, rather than by bond issue, can be advantageous to municipalities and other public operations.

Full information is available upon request from Infilco, Inc., 901 South Campbell Avenue, Tucson, Ariz.

E. A. Murray named manager

. . . of the newly combined sales and service department of Worthington Corp.'s Compressor & Engine Division, Buffalo, N. Y. Everett L. Case will replace Murray as manager of compressor sales—the post Murray held since 1951.

E. A. Murray

E. L. Case

Murray joined Worthington 24 years ago as a sales-application engineer in the compressor-sales department, and subsequently served as assistant manager, then manager, of the department. Prior to joining Worthington, he was with General Electric Co.

Case joined the corporation's student-training program in 1937. He served as a compressor-application engineer as special technical advisor and coordinator to the purchasing department. He later was supervisor of the oil refining and chemical section before his appointment to assistant manager of compressor sales in 1954.

Houston firm is named

. . . a franchised applicator of U. S. Permobond tank linings by United States Rubber Co. Protective Linings Division of Field Erection & Welding Co. of Houston will handle application of U. S. Rubber's corrosive-resistant linings in items for chemical and petroleum industries.

Edward W. Upton is named

. . . executive vice president of Refinery Engineering Co. of Tulsa, a division of Vitro Corp. of America. He replaces D. O. Givens who resigned.

A director of New York Rubber Co., Upton joined Treco in 1957 as executive assistant to the president. Later that year he became vice president in charge of engineering.

Before joining the company, Upton served six years as vice president and general manager of F. H. Maloney Co. of Houston. Prior to that he was with Byron Jackson for 16 years.

Globe Oil Tools Co. expands

. . . its Gulf Coast services. Plans, which resulted in the appointing of seven new division managers in the area, were formulated by J. V. Pennington, Globe president, and L. D. Jones, who will serve as Gulf Coast regional manager.

L. D. Jones

Jones started his oil-field career as a driller and toolpusher, working for various drilling contractors. Later he was named district manager of Magnet Cove Barium Corp. and then district manager of Beaumont Cement Sales Co. Finally he was appointed vice president of Hap Supply Co. and later was made vice president of Tri-State Oil Co.

Named Gulf Coast division managers were: Charles C. Jones, McAllen, Tex.; Tom Latham, Corpus Christi, Tex.; E. P. McDaniel, Houston, Tex.; Bobbie McDaniel, Beaumont, Tex.; Sid Siadous, Jennings and Venice, La.; Jim Pierce, Houma and Venice, La.; and H. J. Reynolds, Brookhaven, Miss.

D. W. Onan promotes

. . . three regional sales managers to new positions specially created within the sales department, reports Roy E. Mullin, general sales manager of D. W. Onan & Sons, Inc.

Edwin C. Swenson was promoted to eastern regional sales manager, where he will be in charge of sales in the territory east of the Ohio and Mississippi rivers.

Arthur R. Johnson was named western regional sales manager, which includes the western states and all of Canada. Paul F. Richardson was promoted to manager, special products

NEWLY COMPLETED PLANT of National Geophysical Co. Inc., consists of 50,000 sq. ft. designed to accommodate the Dallas, Tex. firm's general offices, research laboratories, instrument-manufacturing section, shops, warehouses, equipment-outfitting division, and lunchrooms. The building will also house Namco International, Inc., an affiliated international geophysical concern.

for TANK FARM Inventory Control

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DATA GATHERING AND REDUCTION SYSTEM

For handling such variables as LIQUID LEVEL *(in feet, inches and eighths; metric in millimeters or feet and hundredths);* TEMPERATURE *(one degree increments to three digits);* PRESSURE *(three digits in one or ten pound increments);* FLOW VOLUME *(to five or six digits in one or ten barrel increments or other volume units).* The system will also log the status and provides for the control of operating equipment such as valves, pump motors, etc. Time data and identification points can be recorded as needed to suit the operation. Flexibility is one of the system's outstanding features since it allows the use of standard proven systems for custom applications that would otherwise require special-built, untested units.

FLEXIBLE ARRANGEMENT

Almost any type of logging program can be arranged by using standard sub-assemblies: Logging on prearranged form, with or without point identification, or on random order basis with point identification •••••• Entry of one or more lines of data for log cycle •••••• Time entry at start of each line entry. All numbers, fractions and letters available for logging; carriage shift; black-red ribbon shift provisions.

FLEXIBLE OPERATION

Manual operation without Data Logging by means of a telephone dial which obtains a visual indication of any point included in the system ••••• Manual control of Scanning-Logging Cycle can be started at any time by the operator at any desired point ••••• Automatic Control of Scanning-Logging Cycle can be initiated on a time programmed basis by time clock control.

FOR A COMPLETE ENGINEERING APPROACH TO TELEMETERING SYSTEMS REQUEST PACKAGE 24

THE VAPOR RECOVERY SYSTEMS COMPANY • COMPTON, CALIFORNIA

division. He also will supervise handling of all OEM accounts. Each of the three men started with the company in 1942.

Atlas Pipe appoints two

J. S. (Duke) Hawley has joined Atlas Pipe, Inc., and has opened a Tulsa office for the company. J. Doyle Bain has become a salesman working out of Atlas' Corpus Christi, Tex., plant. The announcements were made by W. H. (Buster) Becker, Atlas president.

Hawley, who had retired last year while with Pan American Petroleum, has handled purchases of oil-country tubular goods for 35 years. Bain is acquainted with oil-field supply circles in South Texas, having been with Wilson Supply Co. and W. C. Norris Mfg. Co.

John A. Schrawger is named

... western division sales representative of Crutcher-Rolfs-Cummings, Inc. He will headquarter in Denver. Schrawger will handle sales and rentals of C-R-C pipeline equipment. Formerly, he was with M. J. Crose Mfg. Co.

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Tube Expanders for Condensers

No. 255—for average tube sheets

No. 270—for thick or multiple tube sheets

No. 255—Adjustable for sheets up to 2¼" thick

No. 270—Adjustable for sheets up to 7½"

#36

IDEAL Ball Bearing Tube Expanders are made of special analysis alloy tool steels, carefully heat-treated to withstand the severest operating strains. They are adaptable for use with any torque controlled tube rolling units—air, electric or mechanical. *Confidence* is your assurance that your job will be done *RIGHT* . . . when you use WIEDEKE Specialized Tube Expanders, Tube Cutters and Operating Accessories. There is a Wiedeke Distributor in every principal city. For further information write for new General Catalog 81.

The Gustav WIEDEKE Company

Dayton 1, Ohio

Oil Well Supply transfers

... Andy C. McDonold, district representative, from Ellinwood to Great Bend, Kans., and appoints Rowland E. Gano manager of its Greensberg, Ky., store.

McDonold was employed by Oil Well Supply Division of U. S. Steel Corp. in 1936 at Russell, Kans. In 1943 he was appointed store manager at McPherson, Kans., and 6 years later was made field representative at Ellinwood. He was named district representative at the latter location in 1952.

Gano started with Oilwell in 1947. He left the company in 1951 and returned in 1955. He had been located in Beattyville, Ky., prior to his appointment.

W. H. (Buck) Royal appointed

. . . manager of the Denver, Colo. office of M. J. Crose Mfg. Co., Inc., announces T. J. Behrenfeld, vice president and sales manager. In his new post, Royal will have jurisdiction over Crose sales-service activities throughout the western states.

W. H. Royal

Royal joined the Crose sales department last year at the firm's Tulsa headquarters. He had previously been assistant sales manager for Browning-Ferris Machinery Co. in Houston, Tex.

Tyson Smith Co. adds

... two design engineers and a sales engineer to its staff, and transfers another sales engineer in the midst of an expansion program.

New additions to Tysco's staff include R. E. (Dick) Holmes and Arthur M. Begley. Holmes has more than 21-years experience in designing oil and gas-process equipment. He has worked for Socony Vacuum Oil Co., Petroleum Engineering, Inc., Foster Wheeler Corp., and Fluor Corp. Begley formerly was a technologist at Shell Chemical Corp.

Dan Parmlee, formerly with Black, Sivalls, & Bryson, Inc., and former branch manager of installation and sales for Graver Tank Co., is a new Tysco sales engineer in the Houston area.

J. E. (Johnny) Johnson has been transferred from Houston to Corpus Christi, Tex., and will work as a sales engineer in the Corpus-San Antonio-Southwest Texas area. He had been with Graver Tank Co. and Union Tank & Supply Co. as a sales en-

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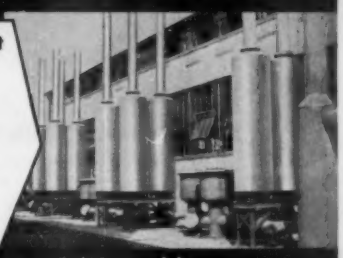

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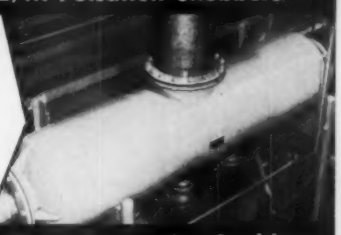

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You Will Find
B/M Recommendations are *Positive*
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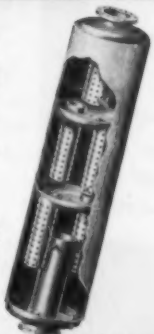

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THREADED PIPE... *It's Tight... It's Best... Costs Less!*

gineer in oil and gas-separation equipment. Johnson has been with Tysco since 1956.

D. H. Jones, C. W. Scamman join

. . . Cathodic Protection Service, Houston. Jones was placed in charge of the company's new Chicago office. Before starting with Cathodic Protection, Jones worked for Duriron Co. as manager of Cathodic Protection sales. Prior to that, he was branch sales manager for Duriron.

Scamman is working with Cathodic's sales division. He formerly was with Houston Oil Field Material Co., Inc. and before that was assistant to Stanley Gill, consulting engineer.

Core Laboratories, Inc. names

. . . six additions to its engineering and consulting department. The newcomers include three reservoir engineers, two senior petroleum engineers, and a senior geologist.

Reservoir engineers are Frank O. Reudelhuber, Bill J. Mealer, and Richard F. Hinds. Reudelhuber's previous position with Core was district manager in the Houston area. Mealer had been assigned to field operations in the Rocky Mountains, while Hinds was recently a member of the firm's reservoir-fluid division.

F. O. Reudelhuber

B. J. Mealer

R. F. Hinds

C. E. Thomas

Newly assigned senior petroleum engineers are C. E. Thomas and Homer C. Osborne. Thomas formerly was with Sun Oil Co.'s production and reservoir-research section, while Osborne was with Superior Oil Co., and Nortex Oil & Gas Corp.

H. C. Osborne

H. L. Keener

Herbert L. Keener, Core's new senior geologist, formerly held the position of division development geologist for Pure Oil Co.

Gifford K. Johnson elected

. . . president of Genesys Corp. of Los Angeles, a new subsidiary of Chance Vought Aircraft, Inc. He was also appointed a director and vice president of Vought. Johnson was formerly Vought's vice president in charge of production.

In his new post, Johnson will direct Genesys' program in advanced control computer systems, data-processing systems, and product development.

The new president began his air-

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craft-industry career 24 years ago at North American Aviation. Six years later he joined Consolidated Vultee, and in 1950 was employed by Vought as production manager. Johnson served as assistant to the president of Vought before his election to vice president.

W. T. Spencer returns

. . . to Triangle Valve Co. Ltd., in Wigan, Lancashire, England, following business trips to Venezuela, Brazil, Paraguay, Bolivia, and Trinidad. Spencer, Triangle's sales manager, earlier visited Germany, Italy, Greece, Holland, Belgium, and all Scandinavian countries. Meanwhile, A. Garlick, Triangle's general manager, traveled to Canada and the United States.

Loy R. Whiteside appointed

. . . manager of the Chicago sales branch of Solvay Process Division, Allied Chemical Corp., reports Arthur Phillips, Jr., vice president. Whiteside succeeds James M. Murphey, who retired after 35 years with Solvay.

Whiteside joined the Chicago sales office in 1937, became chief clerk 3 years later, and was appointed a salesman in 1946.

As branch manager, he will supervise Solvay's sales activities in Minnesota, Iowa, Wisconsin, Montana, and North and South Dakota, along with sections of Illinois and Indiana.

Z. C. Ambrose joins

Z. C. Ambrose

. . . Houston Oil Field Material Co., Inc., as executive vice president, announces Hugh Q. Buck, acting president. Since 1954 Ambrose had been with Associated Oil & Gas Co., where he was president for the past year. He was also president of Prince Marine Drilling & Exploration Co.

Before going with Associated, Ambrose was vice president and manager of Southwest Gas Producing Co. and Carbons Consolidated, Inc., and was president of Monla Gas Co., all of Monroe, La.

He was also a director of these companies as well as of their parent company, Commonwealth Gas Corp. of New York City. For 5 years Ambrose was general superintendent of the Gas & Gasoline Division of Chicago Corp., now Champlin Refining Co.

Richard T. Bright elected

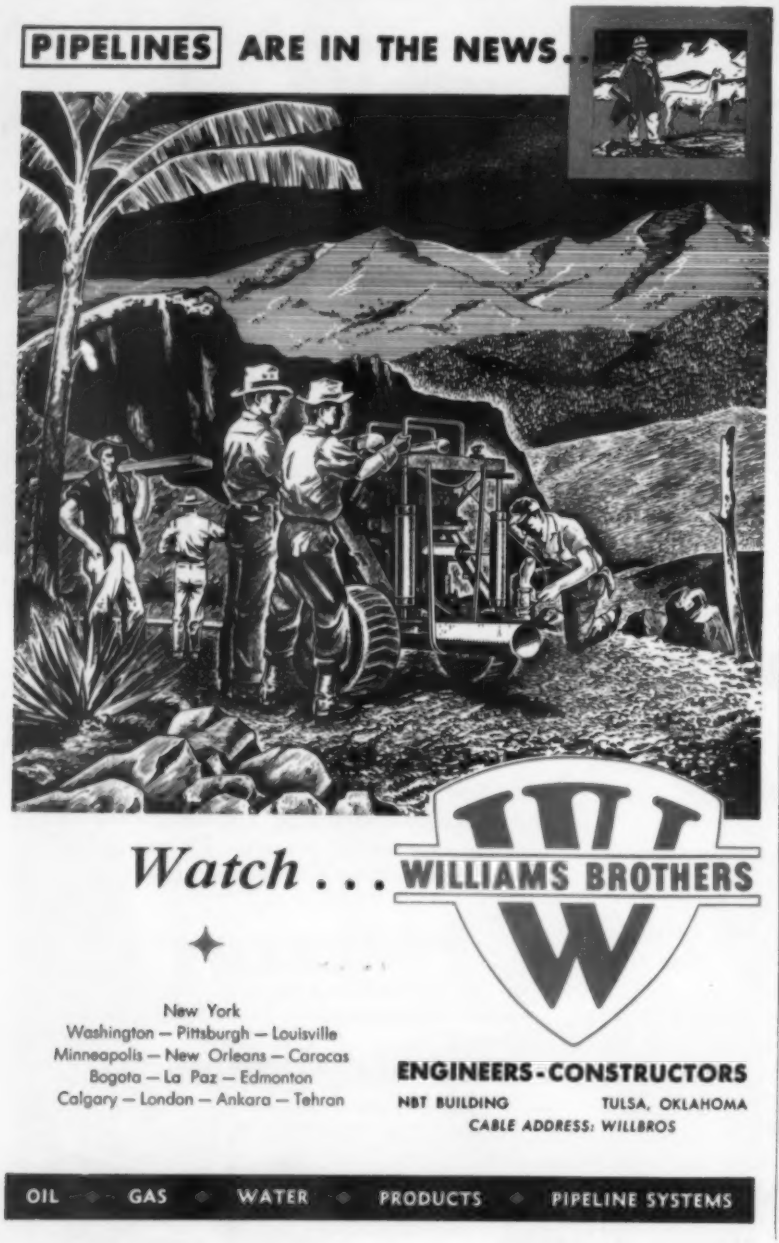
R. T. Bright

. . . vice president of the Mercantile National Bank of Dallas, reports Milton F. Brown, president. Bright, a petroleum engineer in the bank's oil department, was elected assistant vice president in July, 1957. He has been with Mercantile National since 1938. He previously worked for Phillips Petroleum Co., Sinclair Oil & Gas Co., U. S. Geological Survey, and at his own oil business in Tulsa.

C. A. Weaver is named

. . . service manager at Cooper-Bessemer Corp.'s Tulsa field office. The announcement came from George Edick, sales manager of the corporation's domestic division.

Since joining Cooper - Bessemer in 1951, Weaver has been responsible for field-service work in various areas of the country where engines and compressors are used. Now he will be directly responsible for all opera-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Engineering Progress Report
FROM UNION CARBIDE CHEMICALS COMPANY

Acetonitrile boosts butylene throughput 58%, saves $3,000,000 capital investment

Unusual solvent useful in saturate-unsaturate and olefin-diolefin separations

By using acetonitrile as an extractive distillation solvent, Shell Chemical Corporation has boosted throughput of the existing butadiene feed-preparation unit 58% in their Torrance plant. Minor engineering changes for the unit cost $148,000: it has been estimated that a similar throughput increase through new construction would cost about $3,000,000. Development work and operating experience have shown that acetonitrile's unusual solvent properties should prove useful in other saturate-unsaturate and olefin-diolefin separation processes.

ADVANTAGES OF ACETONITRILE

Acetonitrile has boosted capacity in the Shell plant because it increases the spread in boiling points of the C_4 hydrocarbons being distilled. Thus, separation of the hydrocarbons is more efficient than with either acetone or furfural. Relative volatility of n-butane compared to butene-1 is about 1.25 with acetone and about 1.30 with furfural. Acetonitrile increases this ratio to almost 1.4. The spread in boiling points of butene-1 and butadiene is also increased. The table gives data on the relative volatilities of C_4 hydrocarbons in aqueous acetonitrile systems.

After the extractive distillation has been completed, acetonitrile can be completely recovered from the butane and butylene streams with greater ease than acetone. This increased recovery efficiency is due to the high distribution coefficient of acetonitrile in water/hydrocarbon systems.

ENGINEERING CHANGES MINOR

Because of the similarity of the physical properties of acetonitrile and acetone, it is not necessary to change the operating pressure of extractive distillation columns. Shell engineers made only minor changes to their unit. Besides a larger reboiler and a new pump, two heat exchangers were switched and the solvent recovery column was connected to vacuum operation. Aqueous acetonitrile systems do not foul exchanger systems. Corrosion due to hydrolysis of solvent at reboiler temperatures is minimized by pH control.

TABLE 1 RELATIVE VOLATILITIES OF THE C_4 HYDROCARBONS IN AQUEOUS ACETONITRILE, 120 psia

Component	Total Solvent Concentration, 80%m		Total Solvent Concentration, 85%m	
	Water in Solvent 15%m	Water in Solvent 25%m	Water in Solvent 15%m	Water in Solvent 25%m
Isobutane	1.638	1.673	1.637	1.674
n-Butane	1.332	1.347	1.348	1.368
Isobutylene	1.013	1.013	1.013	1.013
Butene-1	**1.000**	**1.000**	**1.000**	**1.000**
t-Butene-2	0.861	0.856	0.865	0.861
cis-Butene-2	0.821	0.813	0.827	0.820
Butadiene-1, 3	0.639	0.599	0.645	0.604
Water	0.08	0.045	0.075	0.045
Acetonitrile	0.043	0.033	0.043	0.033

OPERATING COST REDUCTIONS

The butadiene feed-preparation unit operating on acetonitrile has less solvent-loss than one operating on acetone. *Thus, solvent make-up costs are no higher with acetonitrile than with acetone.* Steam and pumping costs have also been reduced because reflux and circulation rates are lower. This is true even at reduced feed rates.

ACETONITRILE USEFUL IN OTHER PROCESSES

Acetonitrile is effective in other saturate-unsaturate and olefin-diolefin separations. This heat-stable extractant is useful in ethylene-ethane, propylene-propane, and cyclopentadiene-cyclopentane separations. The boiling point spreads between pentadienes, such as isoprene, and pentenes are also increased.

In liquid-liquid extraction processes, acetonitrile is effective in removing tars, phenols, and color bodies from hydrocarbons. Acetonitrile is also useful as a selective solvent for fatty acids.

INFORMATION AVAILABLE

If you're looking for increased efficiency in your extractive distillation or liquid-liquid extraction processes, acetonitrile could be the answer. Detailed information on acetonitrile as an extractive distillation solvent along with information on azeotropic mixtures of acetonitrile is available. For this information, call the nearest CARBIDE Technical Representative—or write, Department B, Union Carbide Chemicals Company, 30 East 42nd Street, New York 17, New York.

Nothing herein shall constitute a recommendation to practice any invention covered by any patent without permission of the patent owner.

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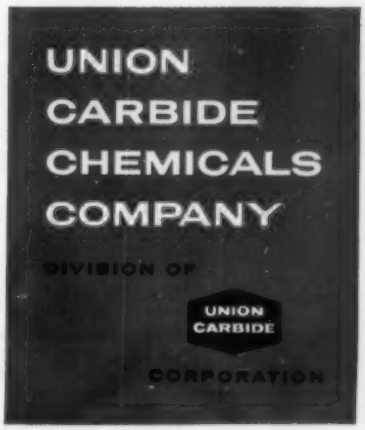

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tions of the company's equipment in the greater Tulsa area. Prior to joining the firm, Weaver was with Fluor Corp.

Lynn McGuffy Co., Inc. named

Lynn McGuffy

. . . sales representative of Industrial Silencer Division of Burgess - Manning Co., according to W. A. Carroll, Jr., division sales manager. As a result, the company, which was founded by Lynn McGuffy in 1952, will be active in the sale of Burgess - Manning snubbers in southern Arkansas, northern Louisiana, and northern Mississippi.

Schramm, Inc. appoints

. . . W. Lloyd Pratt manager of its Air Drilling & Booster Division, where he will direct the company's activities in the sale and rental of specialized booster - compressor equipment.

Pratt gained his experience with this type of equipment in the early days of air drilling in Texas, where he was a territory manager for Schramm.

During the past few months, Pratt has directed more than a dozen operations involving booster compressors in the pneumatic testing of pipelines for gas and liquid-petroleum products.

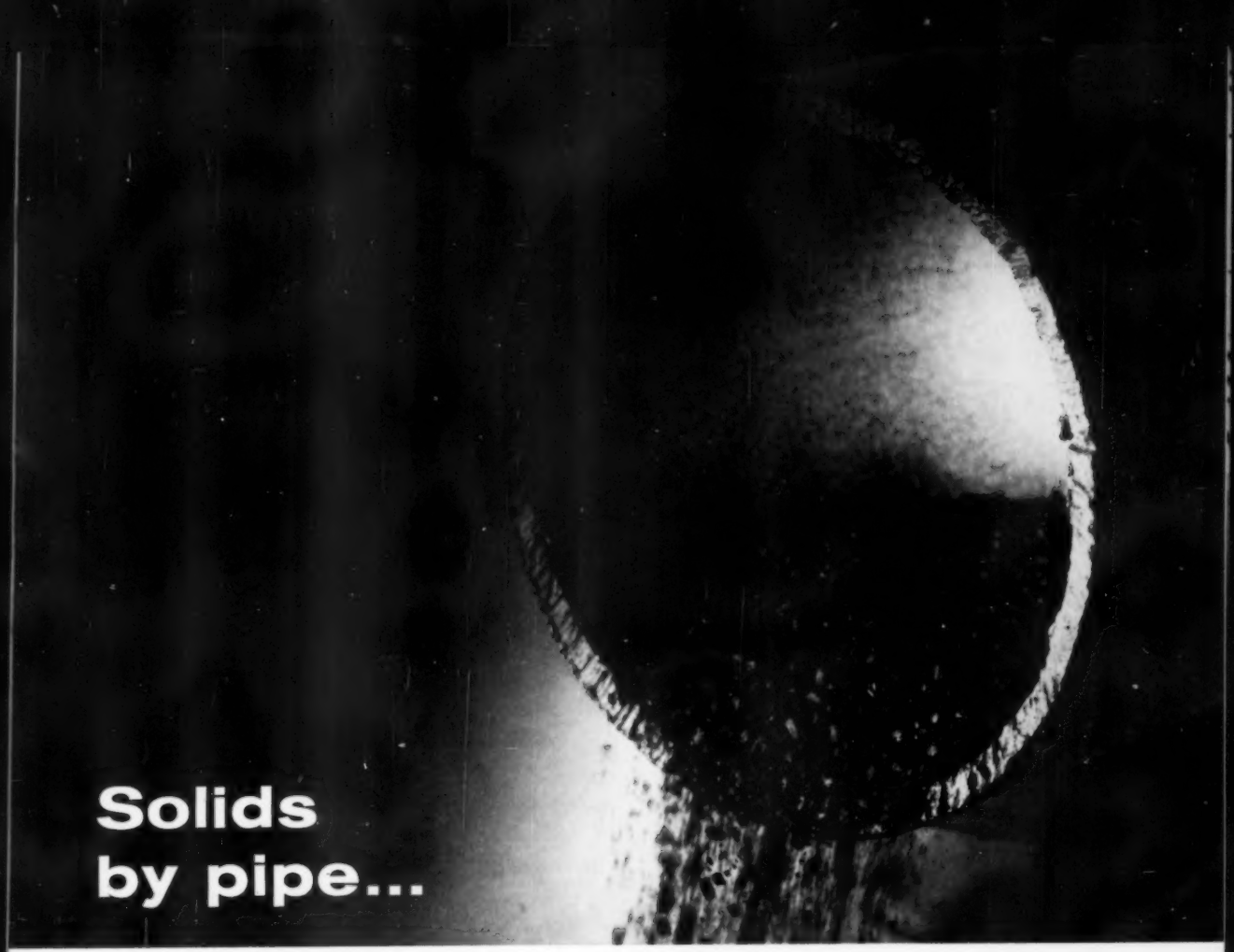
D. M. Jarratt is named

. . . superintendent of Galena Park & Pasadena (Texas) Terminals, announces General American Tank Storage Terminals, a division of General American Transportation Corp. Jarratt will be assisted by C. C. Putnam and B. E. Alford.

John R. Sally is appointed

. . . assistant sales manager of Republic Steel Corp.'s Pipe Division, reports Norman W. Foy, vice president in charge of sales. Sally had been assistant district manager at Houston for the past two years.

He joined Republic in 1948 and, after a year of sales training, was appointed field representative for pipe and named a salesman in the Pittsburgh district in 1953. In November, 1954, he was transferred to the Houston office and advanced to assistant sales manager in April, 1956.



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American Gilsonite's 6-inch pipeline carries slurries averaging 38% solids and 62% water at 350 gallons per minute. It delivers more than 700 tons of solids per day at the downstream end, 80 miles from the eastern Utah mine.

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NATIONAL AND CHAPTER OFFICERS flank Warren Baker, AAODC's new executive vice president, at a dinner meeting held in his honor February 4 at the Dallas Petroleum Club by the Fort Worth-Dallas chapter of the association. At the head table, left to right, are: M. G. Rowe, Rowan Drilling Co., Fort Worth, regional vice president; R. A. Watson, Rowan Drilling Co., chapter secretary-treasurer; Raymond Kelly, Jr., Calvert Drilling, Inc., Fort Worth, chapter vice chairman; John Rhea, Southeastern Drilling Corp., Dallas, chapter chairman; Joe Zeppa, Delta Drilling Co., Tyler, Tex., national president; Baker; Brad Mills, Dallas, retiring executive vice president who stays on in an advisory capacity; W. L. McClusky, M. J. Delaney Co., Dallas, national secretary-treasurer; H. Don Johnson, Carl B. King Drilling Co., Midland, Tex., regional vice president; and Joseph Shelton, Dallas, association general counsel.

More action for drillers

HIGHER producing rates and income for producers will bring more work for the drilling contractor in 1959, Warren L. Baker, new executive vice president of the American Association of Oilwell Drilling Contractors, said in Dallas February 4.

Baker, who resigned recently as editorial director of Gulf Publishing Co. magazines, took over his new AAODC post February 1.

It was at a dinner meeting held by the Fort Worth-Dallas chapter of the association in honor of this occasion that Baker painted his brighter 1959 picture for contractors.

Speaking before 120 contractors, oil-company drilling personnel, and suppliers at the Dallas Petroleum Club, Baker predicted drilling gains despite some adverse factors.

Gains in producing rate and income, he said, should be large enough to more than offset "further advances in costs without compensating crude price gains, a possible steel strike, efforts to achieve wider well spacing, government delay in cutting back imports, and congressional consideration of a depletion-allowance cut.

Along with higher rig activity, Baker said, contractors should benefit also from the fact that there will be fewer surplus rigs vying for business than in the past 2 or 3 years. "The relatively small flurry in activity late in 1958 demonstrated that many idle rigs had been cannibalized to the point that extensive equipment purchases are necessary to put them in operating condition."

Thus, Baker said, the rig increase required to drill the higher footage in 1959 has a fair chance of being big enough to at least check the downward trend in footage rates.

Still lots of problems . . . Further increases in penetration rate will this year again, Baker said, tend to limit to some extent the increase in number of operating rigs.

Too, contractors are faced with a growing need to buy more equipment. Fewer parts can be robbed from already severely cannabalized rigs in the future.

"Furthermore, much of the rig equipment in use today is older than normal since many contractors have postponed buying to the greatest possible degree," he declared. Contractors must be certain, Baker said, that new equipment they buy will result in more efficient operation. If equipment purchases don't fill this bill, he pointed out, they will increase the financial plight of many contractors.

Foreign falloff . . . Joe Zeppa, national AAODC president, told the assemblage that U. S. contractors are

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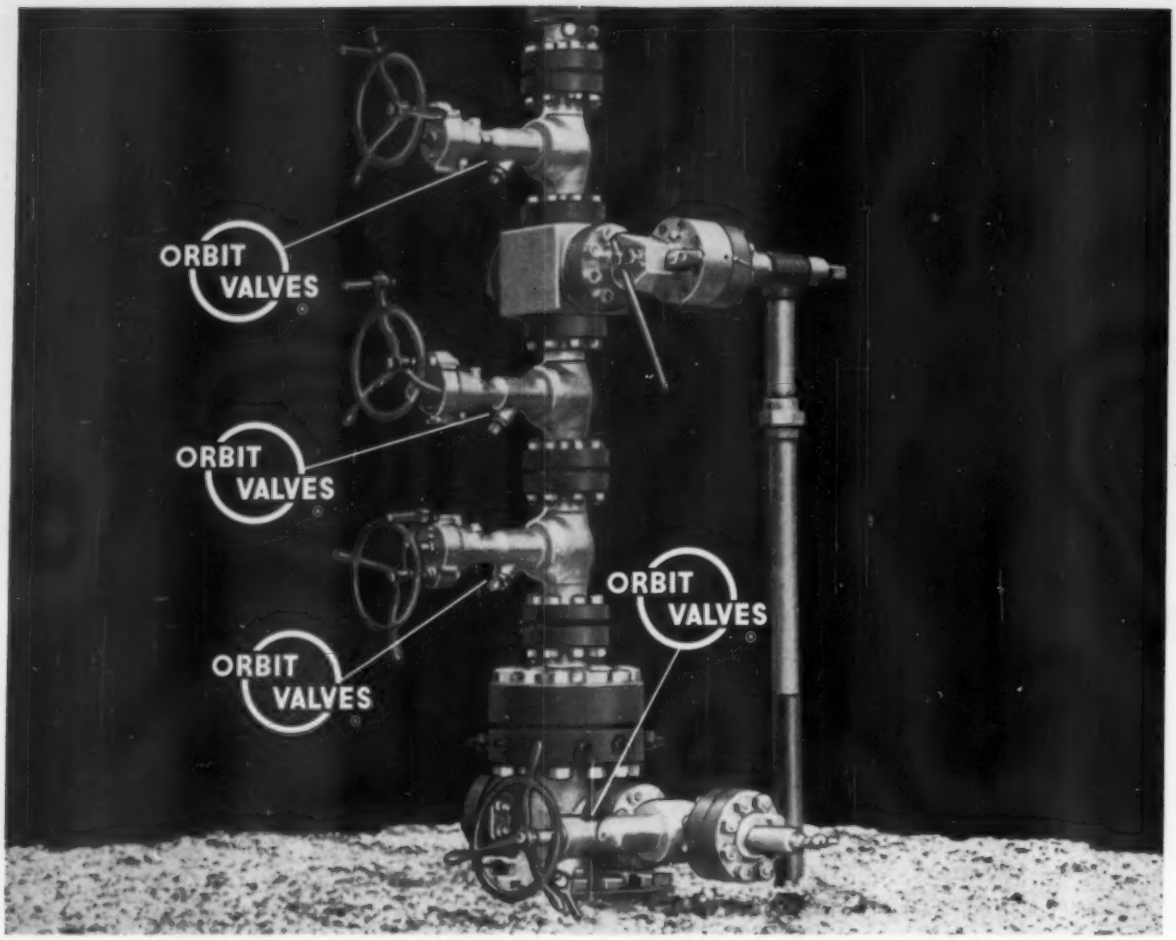

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finding in many countries that foreign work is no bed of roses either.

Venezuela, he said, has had a particularly bad slump in drilling activity. The activity level there is about on a par with that in the U. S. Roughly 50% of contractor rigs in Venezuela are idle, he said.

The drilling contractor will be better off, Zeppa explained, if he gears his operation to deal with tough business conditions for some time. The simple fact is that there are too many rigs for the available work in the U. S., he said. When the rig supply is trimmed to a point more in line with the amount of work available, then the contracting business will again become a profitable one. There are solid indications, he said, that this attrition is already well along.

New record

A NEW SPEED RECORD for shallow-well drilling is claimed by Armstrong-Fowler, Inc., while contracting for Tidewater Oil Co. in Kern River field, in Kern County, California.

The Bakersfield contractor drilled and completed a 906-ft. well in overall time of only 26 hours. This was 3 hours less than the previous record set by the same contractor in the same field.

The new record well is Tidewater's 29 Junction, completed on the pump making 39 bbl., of 13.5°-gravity oil daily. Completion time included installation of a heater. A string of 585 ft. of 8⅝-in. casing with 6⅝-in. liner to bottom was run in the hole.

The well is a part of Tidewater's program calling for the drilling of 53 similar wells in several Kern County heavy-gravity oil fields. They include 30 wells at Kern River, 13 at McKittick, and 10 at North Midway. All are being drilled with contract rigs.

What is believed to have been a factor in the fast drilling in these wells was the use of Halliburton Oil Well Cementing Co.'s new flash-setting cement additive, HA-5. This is credited with cutting down the time usually lost when the water-string is cemented.

Whitney injured

Charles T. Whitney, Sr., vice president and general manager of Coastal Drilling Co., Bakersfield, is recovering from serious injuries suffered in an accident at the site of Coastal's rig drilling for Alaska Consolidated Oil Co. at Iniskin Bay in Alaska.

Whitney was rushed to Province Hospital in Anchorage where he was placed on the critical list.

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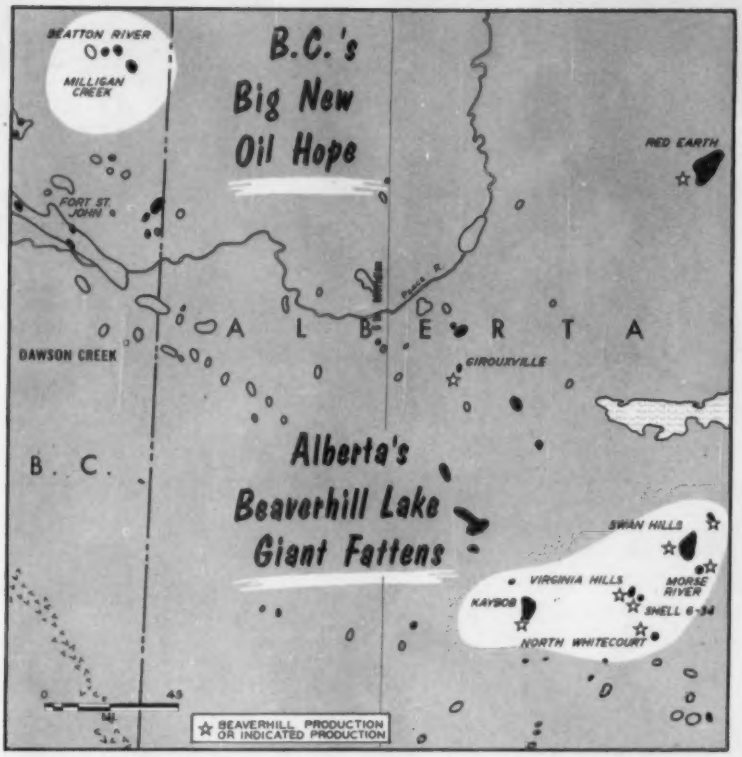

BEATTON RIVER and Milligan Creek in British Columbia, and continuing success at Swan Hills are good reasons why . . .

New green on oil map chases Canada's blues

BY JOHN C. McCASLIN

WESTERN CANADA never ceases to turn up news of exploratory success. Two of the most prolific and important new oil reservoirs on the North American Continent are competing as top contenders for the oil-hunters' plum. Alberta's Swan Hills region added its fourth Beaverhill Lake-Middle Devonian pool in January while a spirited Triassic oil play in the Beatton River-Milligan Creek area gives British Columbia its best oil hope yet.

Devonian oil . . . Busiest new oil field in Canada is Swan Hills. Pipeline outlet now serves the field's 20 or more wells. Winter drilling is buzzing with new locations and completions announced daily.

Exploratory work in and around the Swan Hills region is running high. Newest addition to Swan Hills success is Shell Oil of Canada's 6-34 Swan Hills wildcat, 20 miles southwest of Swan Hills and 5 miles southeast of Virginia Hills. This first attempt for Shell in the area flowed at the daily rate of more than 1,000 bbl. on 22/64-in. choke from Beaverhill Lake. Perforations were over a 50-ft. interval in this Middle Devonian zone.

Operators are guessing as to whether this new find is an extension to Virginia Hills, or a new field. If it is considered a new field, it will be the fourth big Middle Devonian producer in all of Alberta. The current big three are Kaybob, Swan Hills, and Virginia Hills. Beaverhill Lake oil has been found in commercial amounts at North Whitecourt, Girouxville, and far to the north at Red Earth Creek.

Until the discovery of Virginia Hills 2 years ago, this formation never produced in Canada. Now it is the most-aimed-at-target in the country. Why? Gross pay thickness of wells range from 278 to 395 ft. of reef with net pay running from 87 to 148 ft. Pays are thick and rich, and there's a pipeline outlet. These are some of the reasons Swan Hills is Alberta's prime oil reservoir in 1959.

And Triassic oil . . . Far to the northwest of Swan Hills in northeastern British Columbia two new oil fields are making an old exploratory dream come true. Beatton River and Milligan Creek fields are developing into B. C.'s most promising oil reservoirs.

This winter half a dozen rigs are probing the fields, stirred by the tremendous success of eight Triassic wells and one Lower Cretaceous producer and the hint of a major pipeline outlet. Net pay of the wells is 25 ft. Geologists consider the two pools to be separate reservoirs.

Another healthy factor in the field's fast growth is the comparatively shallow pay . . . less than 4,000 ft. Some reserve estimates give the area half a million to 1 million barrels per well. Triad Oil Co. is drilling at Beatton River; Hudson's Bay and Union Oil Co. are digging at Milligan Creek.

Canadian guideposts . . . Oil finders in western Canada have had the blues of late, but events at Swan Hills and in northeastern British Columbia during the first cold weeks of 1959 point up the unending oil potential of this new petroleum province. These two areas of the nation seem destined to lead the oil trek in the western provinces this year. The search for Beaverhill Lake oil won't be confined entirely to the Swan Hills region. Indicated discoveries at far-removed spots last year . . . Girouxville, North Whitecourt, and Red Earth Creek . . . give an inkling of what lies in store in the way of Middle Devonian reefs in northern Alberta. This may be the big year for Beaverhill Lake reef discoveries in Canada.

The search for oil in British Columbia hasn't been going on too long. Gas was the mecca for explorers until a couple of years ago. Milligan Creek and Beatton River will change all this. The push into the north country is on. By this time next year the map of northeastern British Columbia should have some bright green spots on it.

Formations in the Tri-State area of Illinois, Indiana and Kentucky continue to respond to treatment with Dowell special acids.

MAKE YOUR WELLS WORTH MORE

Treat Them With Special Acids By Dowell

In many wells that are suitable for acidizing, problems are encountered that make special acid formulations necessary.

Your Dowell engineer can help you—in many ways—to select the special acid and the treatment technique designed to give profitable results on these wells.

First, he can help you define the problem. He can have samples of the formation and the produced fluid analyzed. He can help you study the reports and decide just what the problem is.

Next, he can help you select the addition agents to make the special acid formulation needed for your well.

Then he can study other well characteristics. He can help you decide on the size of the treatment and the injection rate required. If stage treatments are needed, he can help you arrive at a procedure to be followed. He provides you with Dowell's vast experience in acidizing.

Because every well is different, Dowell offers dozens of addition agents. They may be combined in hundreds of ways to meet almost any special problem. In the box at the bottom of this page, you can see how some of the most popular special acids are used to acidize problem wells.

For prompt service, or detailed information call your nearest Dowell representative. There are more than 165 locations to serve you in the U. S. In Canada, contact Dowell of Canada, Ltd.; in Venezuela, contact United Oilwell Service. Dowell, Tulsa 1, Oklahoma.

Services for the oil industry

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How Special Acids By Dowell Help You Get Better Results From Problem Wells

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STABILIZED ACID will probably save money and trouble. Iron salts, either from the injection water or from corrosion, may be present. If regular acid is used, insoluble iron hydroxide may precipitate and plug the formation as the acid spends. Stabilized Acid contains an addition agent to keep these salts in harmless solution.

If your producing formation is "dirty" –

SILICATE CONTROL ACID contains an addition agent that shrinks water-swollen clays or prevents their swelling during treatment. In addition, it is designed to break emulsions. In many instances, Silicate Control Acid has given excellent results in fields where regular acid actually reduced production.

If you want to acidize a fast-reacting limestone –

ONE OF DOWELL'S RETARDED ACIDS may give improved results by increasing the effective drainage area. These acids are especially useful in fractured, oolitic or vugular formations.

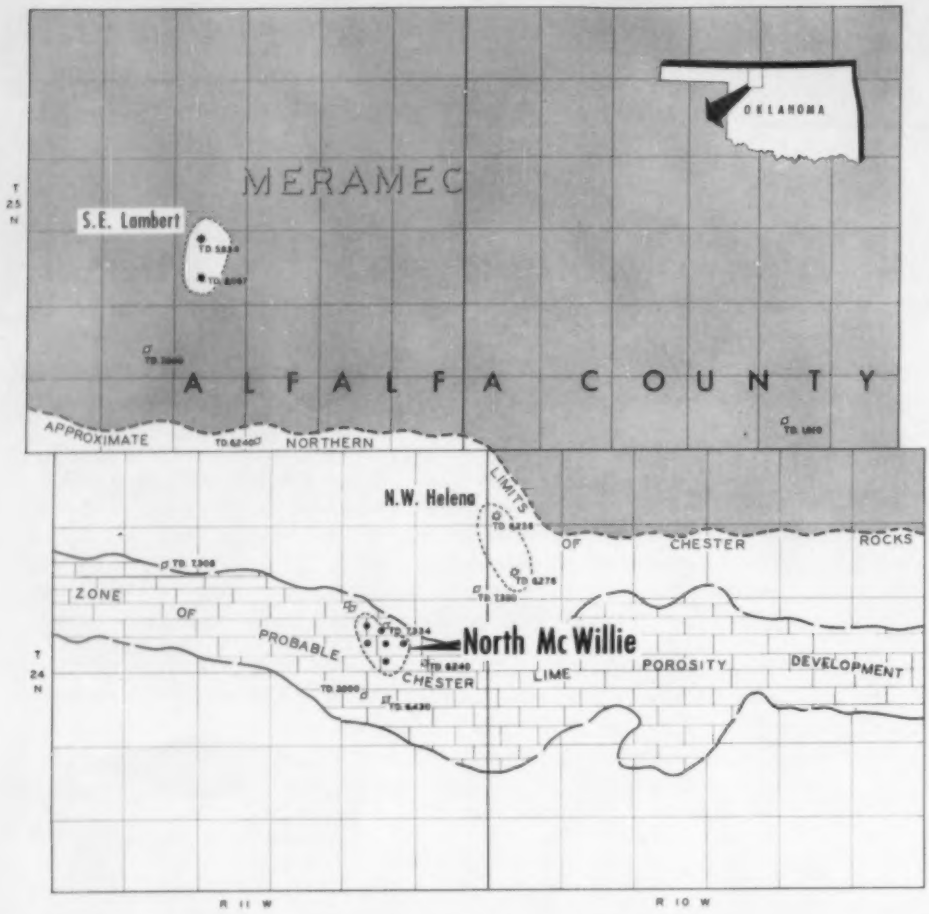
If you expect more than one problem –

USE A DOWELL "SHOTGUN" ACID. These acids generally contain at least three addition agents—to improve penetration, combat emulsions, and prevent silicate swelling. They have given good results in many problem wells. For example, they have been especially helpful where clay-triggered emulsions limit production.

If you are not certain what the problem is –

Or, in any case, let your Dowell engineer help you study the situation and decide on the proper treatment. One of the other Dowell special acids will probably provide the answer—BDA* (Breakdown Acid), Mud Acid, Channeling Acid, Intensified Acid, Heatblast*, Dry Acid, plus modifications of each. Take advantage of Dowell's 27 years of experience in oil well acidizing by calling a Dowell engineer in your area.

*Dowell Trademark



Anadarko basin's north shelf is making oil men wonder:

Are we missing carbonate pools?

BY JOHN T. BADO
Gulf Oil Corp., Oklahoma City

NEARLY 60% of the world's proved oil reserves are contained in carbonate beds. Half the world's present production is derived from this type of reservoir. Carbonate oil is found in all systems except Triassic and Quaternary rocks.

The structural problems of carbonate reservoirs are usually not difficult, because most of the traps are simple anticlinal folds. On the other hand, the relationship of stratigraphy and lithology is more complex, chiefly because of the difficulty of identifying stratigraphic changes and lithology as measurable and definable units. This is especially true in the rocks of the Chester formation of Mississippian age.

Type Field

Carbonate reservoirs in Alfalfa County, Oklahoma, are extremely limited and consist of three one-well fields, one two-well field, and one six-well field—North McWillie field.

North McWillie cannot be classified as a major oil-field discovery, but it has indicated that a new look at the prospective carbonate pays in the area must be undertaken. For purposes of illustration, this field is discussed as a carbonate-type field.

The author, John T. Bado, is exploration geologist for Gulf Oil Corp., Oklahoma City. Since 1955 he has worked as subsurface, production, and exploration geologist for Gulf. Before joining Gulf, he worked with Amerada Petroleum Corp. as geologist in West Texas, New Mexico, and Montana.

This pool is on a northwest-southeast trending anticlinal structure which covers portions of 14-24n-11w, Alfalfa County. It is in the northerly portion of the Anadarko basin of Oklahoma.

The field was discovered in December 1950, by the Smiley, Little and Myers 1 Glidewell, SW SW NE 14-24n-11w. This well completed with an initial potential flowing 7 bbl. of oil per day from Oswego lime. The producing interval is from 5,857 to 5,935 ft., total depth.

Before the discovery of the field,

In looking ahead consider—

1. Rocks of Chester series identified in the Ringwood area, Township 22n-10w and 11w, can be traced northward to their termination in Alfalfa County.

2. Possibilities of porosity and permeability development appear likely along an east-west trending band and are indicated in the paleogeologic map. Future oil or gas production in Chester lime may be expected within this band.

3. Structure will enhance the possibilities of possible Chester production, but porosity-permeability variations also can furnish the trap or reservoir for Chester production. Stratigraphic possibilities in the Chester exist.

4. Prospects of flanking Lower Pennsylvanian sand trends south of North McWillie field may be found.

5. Oswego production appears structurally controlled.

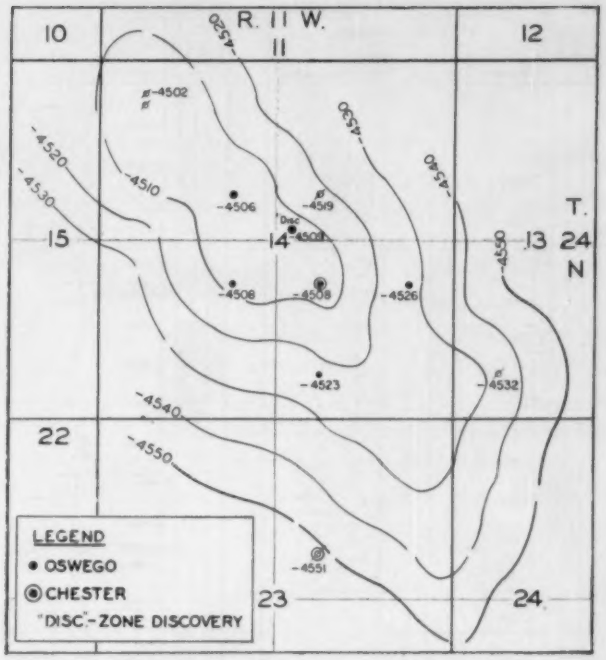
6. When penetrating Oswego lime, careful evaluation of porosity and oil shows should be made.

7. Production possibilities in the lime reservoirs in North McWillie field are proven. Total recoverable oil production is encouraging.

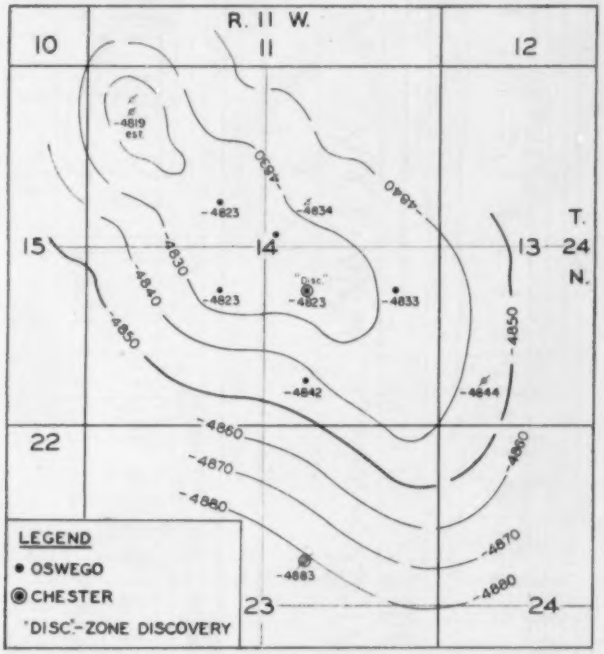
8. Secondary-recovery prospects appear present in the Oswego lime reservoir. Chester lime secondary-recovery production is not attractive due to erratic distribution of porosity and permeability characteristics.

9. Simpson-Wilcox production possibilities may exist in the North McWillie area.

10. Arbuckle prospects in this area are still untested.



STRUCTURE CONTOURS on top of Oswego lime pay.



CONTOURS on top of Chester lime producing zone.

three other wells in the immediate field area had encountered the pay in Oswego lime. Two wells were abandoned because of mechanical difficulties met in trying to complete in this zone. The third well, Gutowsky-Acre 1-A Young, 90 ft. north of NW NW 14-24n-11w, drilled to Oswego and, on production tests from 5,852 to 5,915 ft. reported a production rate flowing 3 bbl. of oil per hour plus 250 M.c.f.d. The 1-A Young was then plugged back to 5,600 ft., to test the Cottage Grove. The sand indicated slight shows of oil and gas, but further testing produced salt water, and the test was plugged and abandoned.

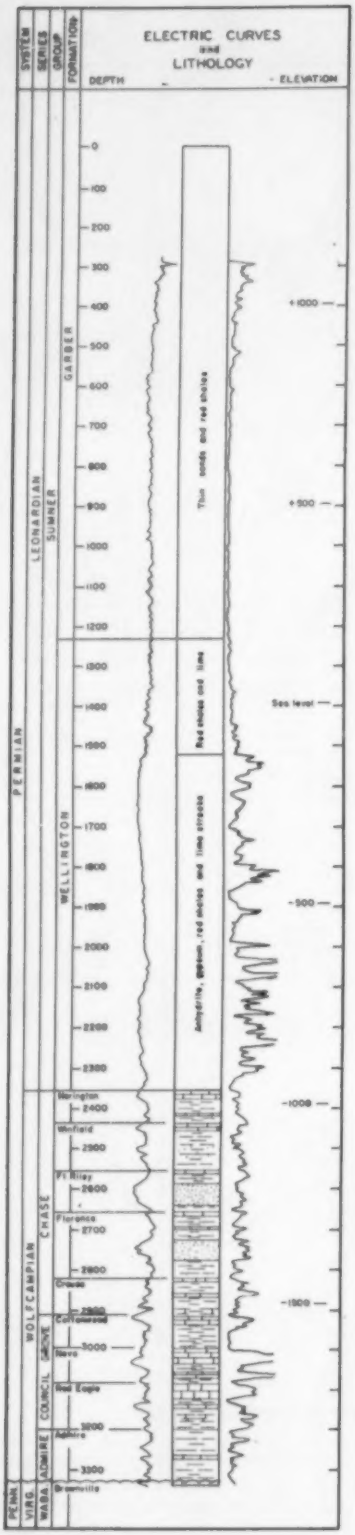
After the Oswego discovery well was completed in December 1950, no active development program was undertaken until June 1956, when Trigg Drilling Co. 1 Nelson, NW SE 14-24n-11w, was completed as a new-zone discovery from Chester lime. After reaching total depth of 6,377 ft. in the Mississippian-Meramec lime, the well was completed from Chester lime perforations, 6,230-38 ft., for an initial flowing production potential of 45 bbl. of 41°-gravity oil per day.

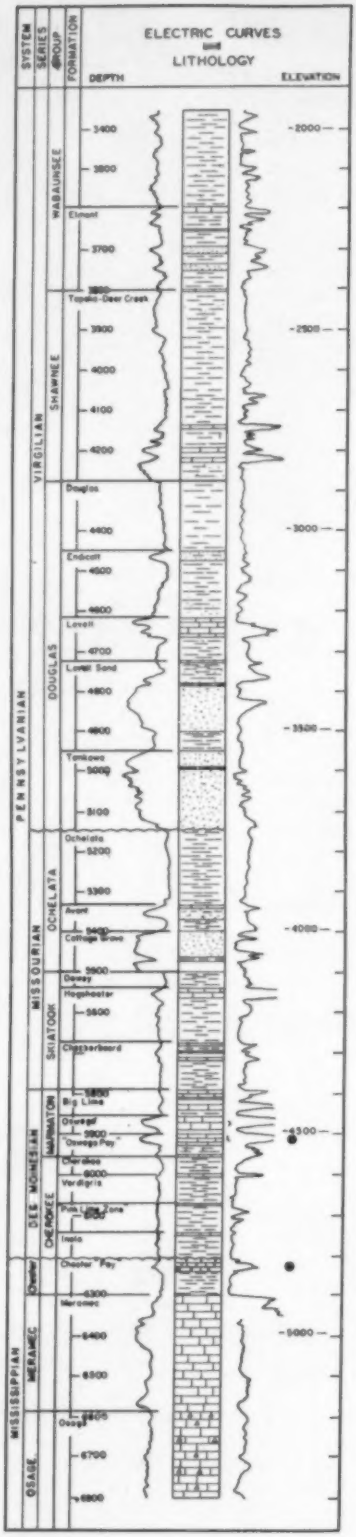
Presently there are six producing wells in the field: five are producing from Oswego lime, and one from the Chester lime.

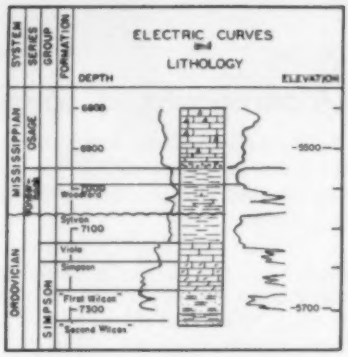
Currently, the primary exploration objective in Alfalfa County is the search for stratigraphic traps occurring in the Red Fork sands of Lower Pennsylvanian.

General Geology and Structure

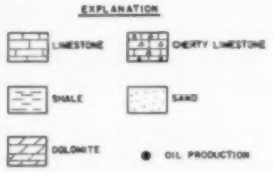
In this area, the erosional limit of the Chester formation appears to co-







Note: This TYPICAL SECTION is based on a composite interpretation using available electrical and sample logs. The nomenclature does not necessarily conform with that of the U.S. Geological Survey.



CARBONATE RESERVOIRS are virtually untapped on the north shelf of the Anadarko basin. Much promise is held for more fields in proven zones and for new pools in pays now untested. Carbonate production in Alfalfa County is currently limited to Oswego, Chester, and Mississippi lime undifferentiated.

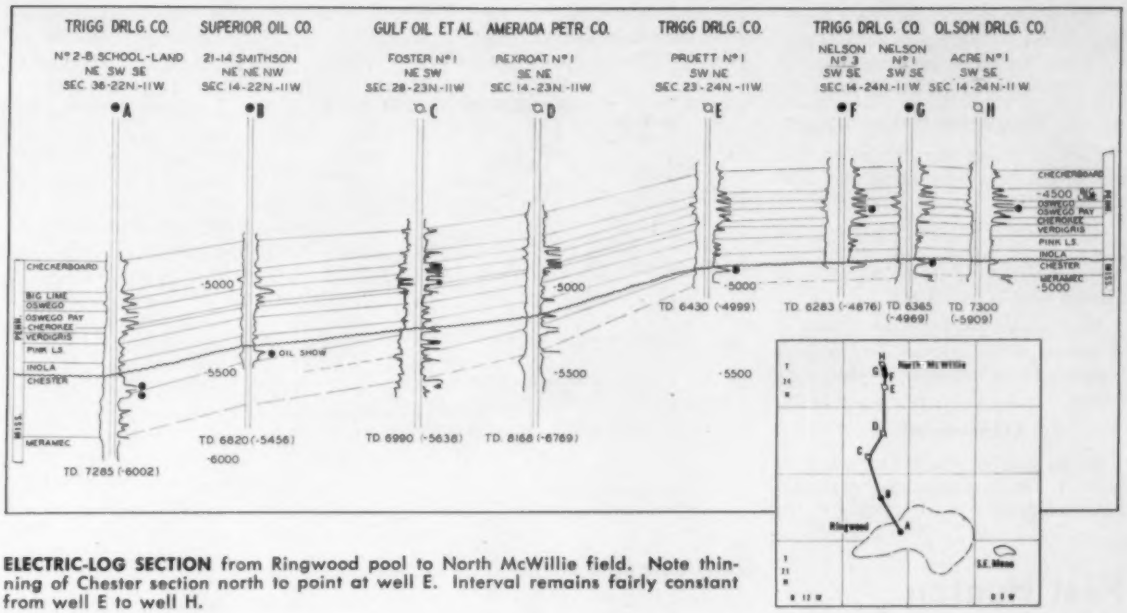
incide with the boundary which divides the deep basin environment (south) from the shelf environment (north) in the Anadarko basin.

Rocks of Cambrian and Lower Ordovician age (Arbuckle) have not been penetrated in this area. The Olson 1 Acre, C SW NE 14-24n-10w, penetrated 172 ft. of Simpson rocks and had penetrated both the first and second Wilcox sands. A thin mantle of Viola rocks is preserved in the area and reaches a thickness of 23 to 30 ft. Sylvan shales in the area reach a thickness of 70 to 75 ft.

Folding and uplift appear to have occurred in post - Silurian - Devonian time and removed the thin mantle of Hunton carbonates, which is preserved in adjacent areas.

Following the deposition of Woodford and Kinderhook shales, the thick, massive lime and chert beds of Mississippian-Osage and Meramec age were laid down. Gentle uplifting and warping probably continued slowly during Mississippian-Chester time, and a major unconformity appears to be present in post-Chester - pre-Cherokee time. The Chester beds were beveled and truncated, forming excellent stratigraphic and porosity - permeability traps in the area. In the vicinity of North McWillie field, it does not appear that beds of Meramec age were truncated.

In the Ringwood area to the south, Township 22n, 10 and 11w, Chester



ELECTRIC-LOG SECTION from Ringwood pool to North McWillie field. Note thinning of Chester section north to point at well E. Interval remains fairly constant from well E to well H.

rocks reach a thickness of 354 ft. (see cross-section). The thinning of Chester rocks to the north is thought to be due both to onlap and truncation. Immediately north of North McWillie area in Township 25n-11w, basal Pennsylvanian (Cherokee) rocks are underlaid by Mississippian-Meramec rocks, and the major unconformity has removed all Chester rocks (see pre-Pennsylvanian paleogeologic map).

No rocks of Springer, Morrow, and Atoka ages of the Pennsylvanian are found in North McWillie area.

Pennsylvanian rocks thin northward across Alfalfa County and contain various lenses of Cherokee-Red Fork sands, which are productive.

A minor unconformity separates the Pennsylvanian and Permian rocks in the area.

Permian rocks of the El Reno group, the Flowerpot shale, outcrop in the field area.

The structure on Oswego lime at a depth of 5,890 to 5,930 ft. is a small, elongated anticline, trending northwest-southeast with about 20 ft. of closure.

The configuration of the Chester structure is comparable to that of the Oswego lime structure. The two structural data conform well as to magnitude of closure and location of the axis of the anticline. The structural high of the anticline appears to be located in the northwest quarter, 14-24n-11w. The anticline measures approximately ¾ mile northwest-southeast and is approximately ½ mile wide.

The accumulation in Oswego and Chester lime reservoirs is due to a combination of porosity-permeability variations and structural closure.

TABLE 1—PRODUCTION HISTORY (TO JUNE 30, 1958)

	Wells producing at end of year			Oil production at end of year	
	Total	Flowing	Pumping	Yearly	Cum.
Field totals:					
1950	1	1	0	233	233
1951	1	0	1	613	846
1952	1	0	1	680	1,526
1953	1	0	1	1,921	3,447
1954	1	0	1	6,404	9,851
1955	1	0	1	5,608	15,459
1956	5	2	3	23,792	39,251
1957	6	3	3	33,321	72,572
1958 (incl. June)	6	3	3	14,172	86,744
Oswego:					
1950	1	1	0	233	233
1951	1	0	1	613	846
1952	1	0	1	680	1,526
1953	1	0	1	1,921	3,447
1954	1	0	1	6,404	9,851
1955	1	0	1	5,608	15,459
1956	5	2	3	12,321	27,780
1957	5	3	2	28,550	56,330
1958 (incl. June)	5	2	3	12,512	68,842
Chester:					
1956	1	1	0	11,471	11,471
1957	1	1	0	4,771	16,242
1958 (incl. June)	1	1	0	1,660	17,902

The lithology of the Oswego reservoir rock can be described as "a white to tan, very fine crystalline to chalky, slightly cavernous, porous, oil-stained lime." The Chester reservoir rock can be described as "a brownish gray to dark gray, oolitic to coarse crystalline, porous, oil-stained lime."

The thickness of the Oswego lime reservoir rock ranges from 17 to 25 ft., of which 15-20 ft. is productive. The porosity of the Oswego lime ranges from 9 to 12%. The elevation and the relief of the Oswego lime is 24 ft. The subsea elevation at present ranges from —4,502 to —4,526 ft., and the drilling depth varies from 5,893 to 5,920 ft.

The thickness of the Chester lime reservoir varies from 7 to 18 ft. The Chester lime has lithologic and porosity-permeability variations across the structure. Variations in porosity and permeability are controlling factors in possible production in the Chester lime. Careful analysis of MicroLogs available indicates that sufficient permeability for possible production was found in only two wells, one of which is now productive from Chester lime. The porosity in Chester lime ranges from 0 to 8%.

The production found in Chester lime occurs at the major unconformity, which separates the Pennsylvanian and Mississippian rocks in the area.

Production History

Table 1 shows the production history of the field from December 1950 to June 1958.

The gravity of the oil from the Oswego lime ranges from 40° to 42° API, while the gravity of the oil from Chester lime is 41° API.

Mud acid treatments were used to stimulate initial production in both Oswego and Chester producing horizons.

Acknowledgment

Permission by Gulf Oil Corp. to publish this article is gratefully acknowledged.

First Hunton in N.W. Oklahoma

IN OKLAHOMA Sinclair Oil & Gas Co. has completed a wildcat in Major County as a gas producer from the Hunton lime.

The 1 Spafford, in NE SE SW 33-23n-16w, flowed 5,571 M.c.f. of gas and an estimated 53 bbl. of condensate per day through a 25/64-in. choke. The Hunton was exposed through perforations at 8,271-8,358 ft.

The well is located 3½ miles northwest of nearest production, and is the first known Hunton producer in northwestern Oklahoma.

The discovery is located on a Sinclair-owned lease block of more than 5,000 acres.

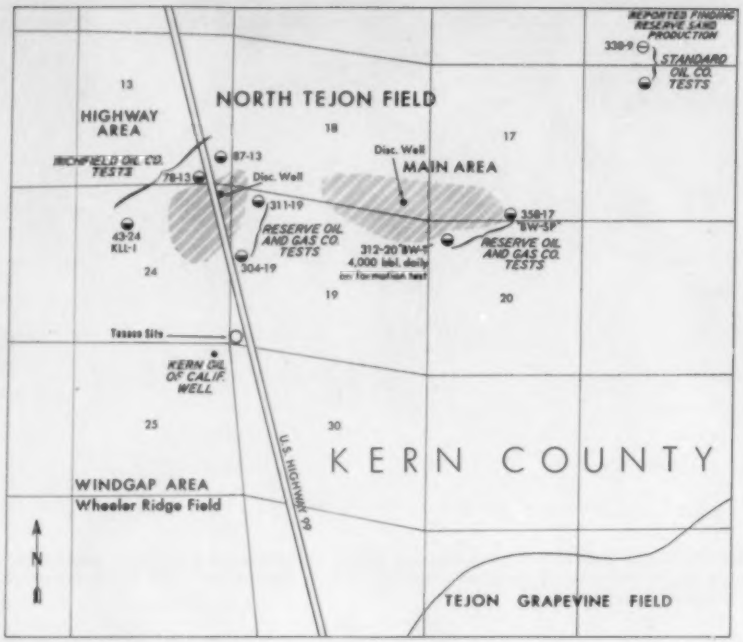
South Texas well taps Frio oil

SOUTH TEXAS' prolific lower Frio formation is being found productive in another Calhoun County wildcat.

The wildcat, drilled by Edwin L. Cox, is 8 miles northeast of Seadrift, in the southern part of the county. It is being completed as a gas-condensate well with pay perforated at 8,828-31 ft. and 8,834-36 ft.

Open-flow potential flow of the well is rated at 4,900 M.c.f. of gas daily. Liquid recovery is in the ratio of 245,000 cu. ft. of gas per barrel. Liquid gravity is 53.5°. Total depth is 9,362 ft.

This well, 1-A Leonard Fisher Unit 1, is Cox's second hole in the area. The first, drilled last year, was junked following a gas blowout.



In Kern County . . .

North Tejon paces California action

EASILY the most active drilling area in California is North Tejon field in Kern County.

With nine rigs drilling, operators are stepping up the pace in an area which offers not only the prospect of big producers, but also a choice of moving out in almost every point of the compass.

The field also offers a choice of three different areas of activity. Of the nine rigs, three are on extension tests and one on a wildcat with a second wildcat location staked for future drilling.

In addition to having three areas in which to drill, plus expansion in most directions from any of the three, the operator at North Tejon also stands an excellent chance of turning up a new discovery.

This latter condition is reflected in the statistic that since its discovery less than 2 years ago, four additional pays have been confirmed.

Here's a rundown on what operators are currently doing in the field's three active areas:

Highway area . . . This area, the most westerly in the field, boasts of the most drilling with five rigs working. They include:

• An extension test being drilled by Richfield Oil Corp. about ½ mile west of the Highway discovery well in 24-11n-20w. This well, 43-24 "KCL-I," was drilling below 8,600 ft. An interesting feature of this test is that it is only two locations south of a 10,040-ft. test that Richfield drilled and suspended last year after finding all Miocene Vedder zones wet. The test drilling and the suspended well rank as the most westerly tests at North Tejon.

• Two rigs are drilling for Richfield on stepouts northwest and north of the discovery well. Both of these are in SE SE 13-11n-20w. The northwest well was perforated at 10,035 ft. with testing just starting. The northernmost well was drilling ahead below 8,149 ft.

• Reserve Oil & Gas Co., discoverer of the North Tejon field, had two rigs on stepouts south and west of the Highway area discovery well. One, less than ¼ mile west of the discovery well, was being dually completed as a new pool discovery. It's 311-19 "W-T" in NW NW 19-11n-19w. The upper zone was perforated in the Z-1-R and Z-1 sands at 9,378-9,426 ft., 9,451-9,790 ft., and 9,511-23 ft. The lower-zone Z-6 sand was found in the interval 11,384-11,715 ft. The south stepout, 304-19 "W-T," was drilling ahead below 9,937 ft.

The latest completion in the Highway area is Richfield 72-24 "KCL-I," one location west of the discovery well. It is dually completed also. The upper Z-1 zone was flowing 647 bbl.

daily of 36°-gravity crude from 8,965-9,130 ft. The lower Z-5 zone was flowing 175 bbl. daily net 42°-gravity crude from 9,536-9,638 ft. Both were on 14/64-in. chokes.

At the time of its discovery last April, more than 1 mile separated the Highway area from the Main area of the field. Since that time, drilling has narrowed the gap to less than ½ mile. Permeability in this lower Miocene Zemorian pay appears to control productivity. Production has been extended several locations west of the discovery well in NE NE 24-11n-20w but the wet zones encountered in the suspended 10,040-ft. well drilled ½ mile west of it will probably limit production in that direction. Eastward development doesn't appear to offer any problems. Operators are optimistic that the Highway and Main areas will eventually be linked up.

The Highway area also has an Eocene zone discovery several locations southwest of the area discovery well. Last November, Richfield found Eocene production at 10,914-11,331 ft. in 63-24 "ROC-KCL." Initial production was 236 bbl. daily of 52°-gravity crude.

An interesting feature of the field is that the Miocene pays are found at depths ranging from 8,700 ft. in the Highway area to 12,000 ft. in the Main area just 1 mile away.

Main area . . . The main area of the field in the corner of Sections 17, 18, and 19-11n-19w currently has two rigs busy in it. Both are drilling for Reserve. One of the tests, 312-20 "BW-T," located several locations southeast of the field discovery well, recently recorded one of the best formation tests of any well in the field. It tested at a rate of nearly 4,000 bbl. daily in the Z-1 sand at 11,525-11,688 ft. Flow was through a 16/64-in. choke.

The other test, 358-17 "BW-SP" in SW SE 17-11n-19w, was just getting underway with drilling around the 350-ft. level.

The structure in the Main area is labeled an east-west trending flank of the northerly plunging nose defined in the Highway area. This flank could possibly be the north flank of an easterly trending anticline or nose also.

Reserve plans to continue drilling on 312-20 "BW-T" despite the excellent test rate of the Z-1. This development offers encouraging prospects for extending the field still southeastward from the discovery area.

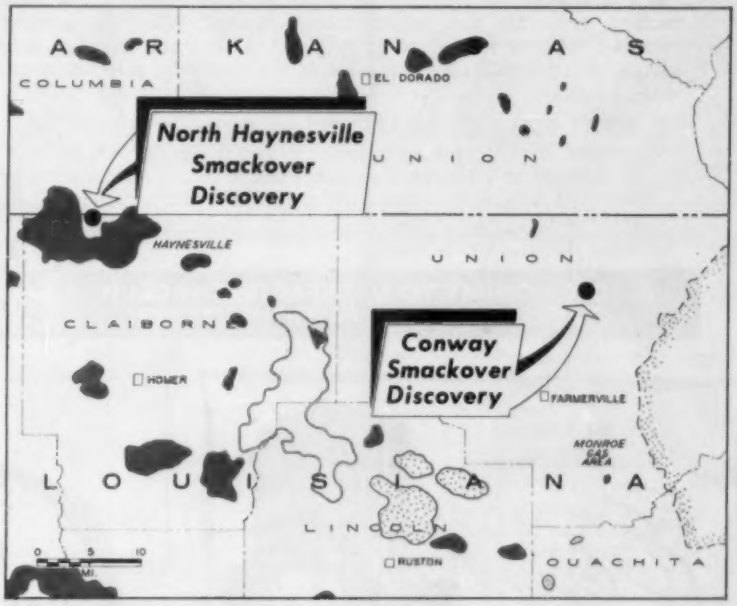
Third area . . . The third area of activity associated with North Tejon field is as yet unnamed and still doesn't boast a completed well. However, there are two rigs drilling there. The tests drilling are:

. . . Standard Oil Co. of California was drilling and coring below 11,081 ft. in a wildcat located in SE SW 9-11n-19w, about 1½ miles northeast of the Main area of the field. This well, 338-9 Universal Cons.-SP, found the Reserve sand productive at 7,858-7,900 ft. earlier in its drilling. It flowed at a rate of 500 bbl. daily on a test of the Reserve. Standard, as operator for itself and Universal Consolidated Oil Co. was drilling ahead in search of the Vedder pays found in the Main and Highway areas of the field.

. . . A second Standard test in this area, just 900 ft. south of 338-9 Univ. Cons.-SP., was drilling below 6,000 ft.

The Texas Co. also indicated it was about ready to join the search with a location staked in SW SW 19-11n-19w, about ½ mile south of the nearest Highway area producer and 1 mile southwest of the nearest Main area well.

This Texaco site is only about 700 ft. northeast of a well completed by Kern Oil of California, Ltd., last month in the northeast corner of 25-11n-20w. The Kern well, which was completed in the deeper Z-6 zone at 10,740-75 ft., flowed 190 bbl. daily of 53.8°-gravity condensate through a 16/64-in. choke.



Smackover hits as . . .

Jurassic play soars in Ark.-La.

NORTH LOUISIANA'S Jurassic play is coming up with two more Smackover discoveries. One opens an entirely new field in Union Parish. The other is in the Haynesville area, northern Claiborne Parish, but more than 3 miles from previously discovered Smackover production at Haynesville.

They are the third and fourth new fields opened in North Louisiana this year. Discoveries of two new Tuscaloosa (Upper Cretaceous) fields preceded them. Both of these are in Catahoula Parish.

Olin Oil & Gas Corp. has the Union Parish Smackover discovery, which has been designated as Conway field. It is 4½ miles east of Conway townsite, and nearly 10 miles off the northwest side of the old Monroe gas rock area. Nearest Smackover production is 18 miles southwest at Bernice, in southwestern corner of the parish.

The Smackover pay in this well is from a perforated interval at 8,605 ft. in hole drilled to 8,784 ft. The well (1-R Oline fee) flowed 134 bbl. of 37°-gravity oil per day through ⅛-in. choke with pressure of 725 psi. Spot location is in 13-22n-1e.

Testing of the Haynesville discovery still is under way. The well, drilled by Alvin M. Jackson and Cheyenne Oil Corp. to total depth of 10,646 ft., has at least 36 ft. of effective Smackover pay from 10,352 ft. to 10,507 ft. Open-hole drill-stem tests, one at 10,-355-10,402 ft. and the other at 10,-

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456-10,507 ft. recovered 7,400 ft. of oil in each case. Gravity of the oil was 41.8° in the first test, and 45° in the second. Since then casing has been run through these intervals to 10,630 ft., and perforated.

The well, 1 H. N. Greene Unit, in 6-23n-7w, is on the north side the old Haynesville field. Faulting separates it from previous Smackover production at Haynesville and East Haynesville fields, more than 3 miles south. The discovery is being set up as North Haynesville field. It is a mile east of Haynesville's shallower Pettet production. It is only a quarter mile from the Arkansas line.

Ark.-La. book released

The Shreveport Geological Society announces the publication of Volume 4 of "Reference Report on Certain Oil and Gas Fields." The new volume has 95 pages of text and 91 pages of illustrations.

The publication includes reports on the following Arkansas fields: Kiblah, Miller County; Horsehead, Columbia County; Southwest Willisville, Nevada County; West Midway, Lafayette County; and Kress City Lafayette County, Arkansas.

It also includes these Louisiana fields: Topy Creek, Bienville Parish; Baskinton, Franklin Parish; Jeems Bayou, Caddo Parish; Killens Ferry, Franklin and Tensas parishes; Mount Sinai, Claiborne Parish; Bee Brake, Concordia Parish; Esperance Point, Concordia Parish; Hogue - Esperance Point, Concordia Parish; North Est. Esperance Point, Concordia Parish; South Esperance Point, Concordia Parish; South Sarepta, Bossier and Webster parishes; Colquitt, Claiborne Parish; Antioch, Claiborne Parish, and Athens, Claiborne Parish, Louisiana.

Others included are: Rodney Island, Tensas Parish, Louisiana, and Jefferson County, Mississippi; Woodlands, Adams County, Mississippi; Idlewilde, Jefferson County, Mississippi, and Shamburger Lake, Smith County, Texas.

Three stratigraphic papers on the Sligo, Austin - Tuscaloosa, and the Trinity are also included.

No Stevens sand at Bakersfield try

Union Oil Co. of California's fourth effort to find Stevens zone production under residential west Bakersfield in Kern County failed.

Union abandoned at 7,616 ft. A-2 Oak Street.

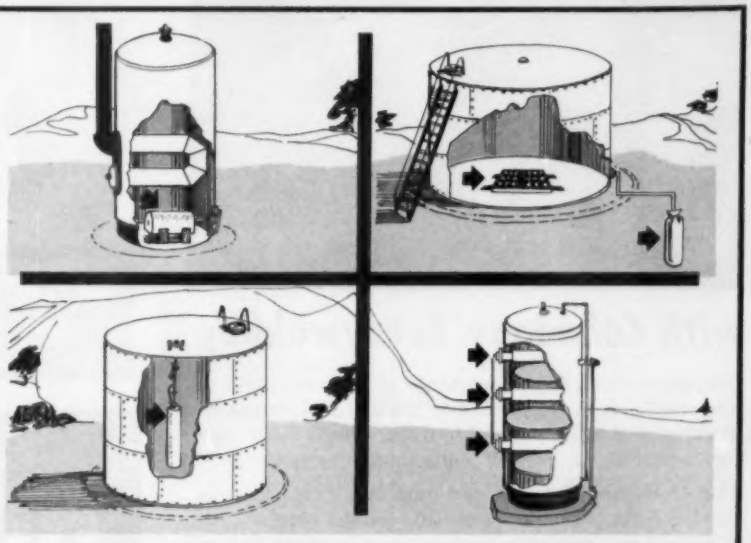
Eaglesham—new Alberta reef

ANOTHER Devonian reef discovery was uncovered in Alberta when the team of Hudson's Bay Oil & Gas Co., Ltd., and Union Oil Co. of California drilled into the Woodbend sector of that formation and recovered a flow of light gravity oil.

The new strike, while not as prolific as the recent Simonette River-Woodbend reef discovery hole, does point out that there may be a sizable reef buildup in the area and will certainly spur further drilling. The new discovery well lies in the Eaglesham region of northwestern Alberta and is only 18 miles southwest of the Normandville producing area. That latter field contains the same Woodbend reef structure as well as other oil production in the Winterburn, or DI horizon, oil in the Jurassic zone, oil in the Triassic horizon and two separate natural-gas-producing sections.

• The strike, Hudson's Bay-Union 10-14-77-25 Eaglesham is going down on LSD 10, 14-77-25w4.

The well is in an area that has been pretty well explored for Devonian



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The drawing shows five of the methods by which such protection can be set up. For internal protection, anodes can be suspended from the top; inserted through side openings; or bolted to or set on wooden supports at the bottom. External protection of tank bottoms is usually achieved by burying anodes in the soil near the tank.

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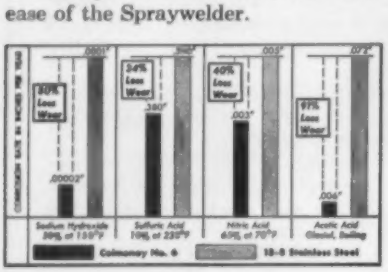

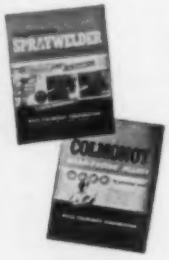

This table shows the comparative resistance to corrosion of Colmonoy No. 6 and 18-8 stainless steel. No. 6 is resistant to almost all caustics and acids. Ask for Engineering Data Sheet No. 3.

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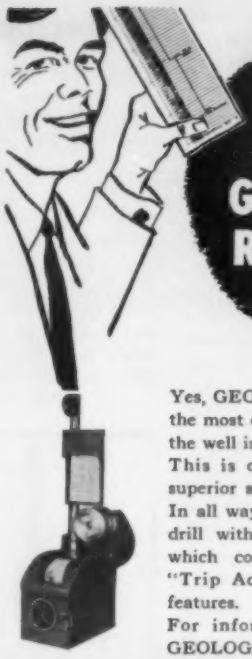

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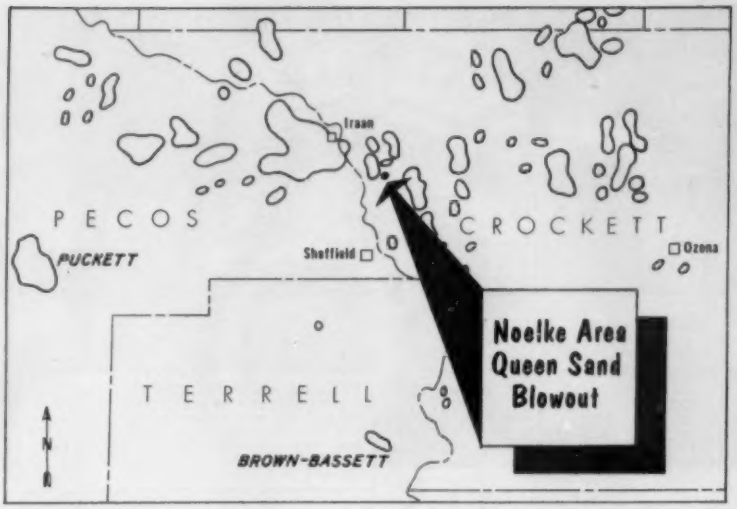
prospects but the current venture is the only drill site currently active within 20 miles. While the general area has had its exploration, it is felt that the new well site will spark a new play as there are many instances in the region where further exploration could uncover more reef oil and gas deposits.

The reef was contacted at the 7,600-ft. level and two separate drill-stem tests run in it. The first, covering 22 ft. of zone flowed light-gravity oil to the surface after the valve on top of the drill stem had been open for 12 minutes. Natural gas, meanwhile, accompanied the oil flow and was measured at maximum, 2 M.M.c.f.d. Another test immediately below the first flowed and oil and salt water emulsion which indicated a fairly thin zone. However, company geologists feel that completion will result in commercial success as a 40-ft. pay section is felt to be present.



SCENE of big blowout in Crockett County, West Texas.

Californians look at fault block

Prospect for another fault block pay in the Windgap area of Wheeler Ridge field brightened with a reported 1,140-bbl.-daily formation test of a "JV" interval in a Richfield Oil Corp. well. The Richfield well, 36-30 "ROCO-MJM & M," tapped the "JV" at 8,530-8,719 ft. It is a southeast-extension test to the Windgap "JV" discovery well completed in March 1957.

Stensvad confirmed in Montana

RESULTS of a successful test of the confirmation well in Stensvad field of Rosebud County, Montana, were announced by Pan American Petroleum Corp.

Pan American's 1 Getchel, east offset to the field discovery well, flowed 133 bbl. of oil in 5 hours on a 30/64-in. choke. Production is from the Tyler "B" sand, through perforations 5,368-5,400 ft. The zone was topped at 5,366 ft.

The well was drilled to the total depth of 5,509 ft. and was plugged back to 5,472 ft.

The 1 Getchel is located in 12-11n-32e, Rosebud County. Pan American owns full interest in the well and in 860 net acres in its immediate vicinity. Stensvad field was opened last December by Honolulu Oil Corp.'s 1-11 Stensvad.

West Texas blowout shut in

FOR A DAY OR SO it rained oil in Crockett County from a blowout well, just as it did in the early days of drilling.

Reports said there was a full 7-in. stream of oil coming from the well, but with little gas drive. Estimates on the flow ranged to 100,000 bbl. for the 24 hours it was out of control.

The well is Fred Turner, Jr. 3 Shannon "BB," 5 miles southeast of the town of Iraan, and a ⅜-mile step-cut to the recent discovery of Southeast Noelke field.

Operators of the cable tool rig had set 7-in. casing at 1,835 ft. and drilled out to 1,839 ft. A third core was being cut in Queen sand at 1,851-53 ft. when tools were blown out of the hole by the heavy stream of oil. Roads were blocked for miles around the well until it was brought under control. There was no fire and no injuries in connection with the blowout.

No drilling boom . . . No. 3-BB Shannon put a lot of oil around the countryside in a short period, but no drilling boom is expected because of it. The same operator's 1-BB Shannon opened Southeast Noelke (Queen) field early in December 1958, pumping 75 bbl. of oil a day from open hole at 1,923-44 ft. Turner 2-BB Shannon, one location southeast of the discovery, was finaled on the pump on January 14 for 80 bbl. of oil a day from open hole at 1,897-1,917 ft.

Most of the acreage in the vicinity has been under lease for years and much of it has been drilled. No. 3-BB Shannon is in Tract 22, Archer County School Land Survey No. 4. It is 1 mile southwest of Queen gas produced in Noelke field, but separated by a dry hole; it is 2½ miles west of Olson field, and separated by a deep failure; and it is 1 mile east of oil production in Noelke field, separated by dry holes.

In view of the nearby production, and dry holes, geologists have declined to comment on the prospects of 3-BB Shannon. Meanwhile it is shut in until cleanup operations are completed.

Reef found at Michigan test

BEST new oil prospect in the St. Clair County play for Niagaran reef production is Panhandle Eastern Pipe Line Co. 1 Mandziara SE NW SW 32-4n-15e, that showed 2,400 M.c.f. gas on drill-stem test at 2,325-2,400 ft. and 300 ft. of oil in 30 minutes on second test at 2,561-2,631 ft. Reef logged high at 2,370 ft. with oil zone from 2,560 to 2,600 ft. Casing was cemented at 2,729 ft. for later perforation completion.

Mandziara is in the so-called Boyd area, 3 miles southwest of Peters reef oil pool, and where gas already was being produced commercially and two other wells tested for Salina-Niagaran oil.

Four new locations were staked following completion of H. V. Young 1 Oard, NW NE SE 25-18n-1w, Gladwin County, on the east edge of the 1938-developed North Buckeye field. Well completed for 135 bbl. oil day from Dundee at 3,636 ft.

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Wolverine drillers have troubles

UNCERTAINTY over final spacing orders and severe winter weather have caused the relatively slow start of development in both the Albion and Pulaski plays in southern Michigan.

Sam Garfield 1 Rosenau, NW SW SW, Section 23-3s-4w, 1,320 ft. south of the Albion discovery, logged Trenton objective at 3,889 ft., picked up loss zone and gas in dolomite at 4,024-71 ft. and is drilling ahead. The only other start is Carter Oil Co. 1 Farley, NW SW NW, Section 23-3s-4w, the 1,320-ft.-north offset to the discovery.

No offsets have been moved in to the Pulaski strike between Albion and the Scipio pool. Turner Petroleum Co. 1 Blair, 20-4s-3w, Jackson County, is flowing average 170 bbl. oil per day on plunger-lift.

Pulaski is under a 21-day emergency order limiting spacing to 40-acre units. Albion was approved for 20-acre units on January 22 by the state supervisor of wells but has been scheduled for a new hearing.

Out of a dozen companies with lease holdings in the two plays, Carter so far is the only one to push for 40-acre locations. Others have endorsed 20-acre units. Hearings on both fields will be held by the state supervisor on both matters February 11.

Eleven permits were issued by the state for the week including four wildcats located as follows:

Ferguson & Ferguson 1 Robinson, SE SE SW, 17-6n-15e, St. Clair County; Taggart Co. 1 Gersey, SW NE SE, 36-2s-13w, Van Buren County; Leonard Oil, Inc. 1 Laarman, NE NE SW, 19-21n-7w, Missaukee County; and Hanners Oil Co. 1 Adams, SW NW NW, 11-5s-4w, Hillsdale County.

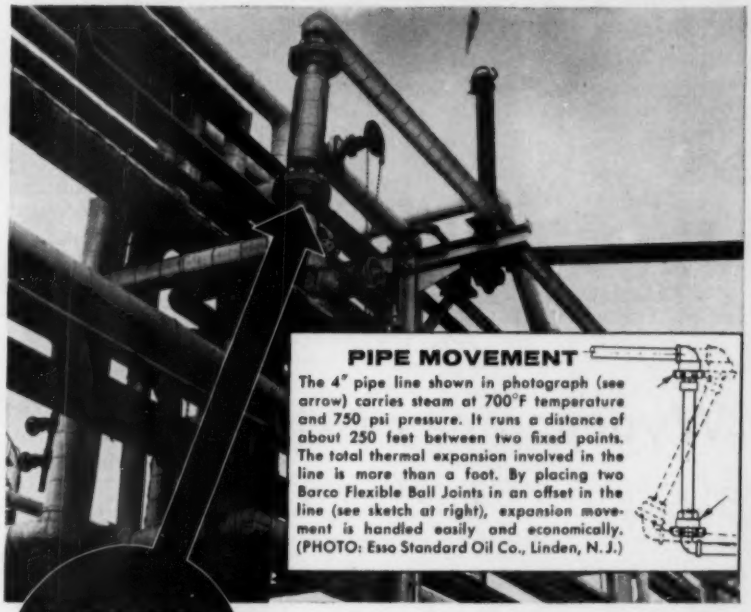
Kentucky data book released

The Kentucky Geological Survey announces the release of "Compilation of Coal and Petroleum Production Data for Kentucky," by Thomas J. Crawford, Kentucky Geological Survey.

This is a statistical compilation of the coal and petroleum production of Kentucky. It incorporates under one cover the production data by year and county from earliest records through 1957.

Price, including packaging and postage, is $1.10.

How Refinery Handles 700°F. STEAM . . . PIPE EXPANSION



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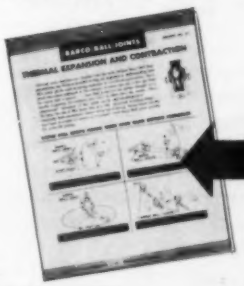

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In Colorado . . .

Ancient Florence field revives

THE second oldest field in the United States, Colorado's Florence field, added another chapter to its century-old history with a 400-bbl.-daily well brought in by Peak Petroleum Co.

The oldest continuous producing well in the nation is in this field, and still yields a few barrels of oil every 2 or 3 days. The first well was drilled in the field in 1869, while Colorado was still a territory. Since then it has produced an estimated 15,000,000 bbl. of oil. The area still has 41 shallow wells pumping.

The newest well—the first major strike in 25 years—was made at 2,320 ft. on land owned by Tom Hayes of Florence and subleased from Mile High Oil Co., Pueblo, Colo.

Bill Geary, Peak president, said the well caught fire shortly after it came in, was allowed to burn overnight, then was controlled and capped. The Peak firm has drilled 14 wells in the field, with only 4 showing oil. The company uses compressed air instead of mud to speed drilling operations.

Wyoming pay extended

IN WYOMING Delhi-Taylor Oil Corp. has extended first Frontier sand production with the completion of the 29 and 30 Federal Hill in North Meadow Creek field, Johnson County, in a joint venture with St. Louis Car Co.

On a potential test the 29 Federal Hill flowed 325 bbl. of 40°-gravity oil per day through ¼-in. choke with tubing pressure of 390 psi. after an open-hole fracture treatment from 6,433-86 ft. with 24,000 lb. of sand and 16,000 gal. of lease crude. The 30 Federal Hill well was fractured in open hole from 6,550-99 ft. with 30,000 lb. of sand and 20,000 gal. of lease crude and flowed approximately 235 bbl. per day through a ⅞-in. choke with tubing pressure of 500 psi.

Based on information derived from these two completions and on present spacing, it appears that there will be 12 additional locations to be drilled. Delhi-Taylor is also participating in a unitized waterflood project in the Sussex and Shannon sands in North Meadow Creek field.

Ohio drills probe to new depths

The jointly drilled deep test by Ohio Fuel Gas Co., East Ohio Gas Co. and Wiser Oil Co. known as the 1-A F. Smith, in Lot 69, Hinckley Township, Medina County, has been completed with open flow of 1,210 M.c.f. and rock pressure of 2,100 psi.

Rotary tools drilled to total depth to 7,040 ft. and several zones were tested before well was plugged back and acidized from 5,775-90 ft. in a dolomitic limestone formation near the Cambro-Ordovician contact.

Location was on a known "high" in shallower formations and was selected following seismograph and magnetomer surveys. Production tests will be made to investigate the commercial value of the discovery as it is the most encouraging reported in Ohio from formations below the Black River.

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New book discusses Oklahoma's Harper

The Oklahoma Geological Survey announces release of Bulletin 80 dealing with the geology of Harper County. The bulletin, authored by Arthur J. Myers with a section of petroleum geology of the county by Louise Jordan, J. Durwood Pate, and Sidney R. Williamson, is available from the Oklahoma Geological Survey at Norman.

This report presents the results of a detailed study of the Permian, Cretaceous, Tertiary, and Quaternary rocks that crop out in Harper County. It deals with one of Oklahoma's most important new gas-producing regions.

Deep Kentucky test shut down for repairs

In Martin County, Kentucky, United Fuel Gas Co. 1 J. W. James wildcat located 1 mile southeast of Inez and on Coldwater Fork is shut down for rig repairs at a depth of 3,301 ft.

Although located within the confines of Big Sandy gas field, well will be the first in the region to try for production in Cambro-Ordovician beds overlying the basement complex.

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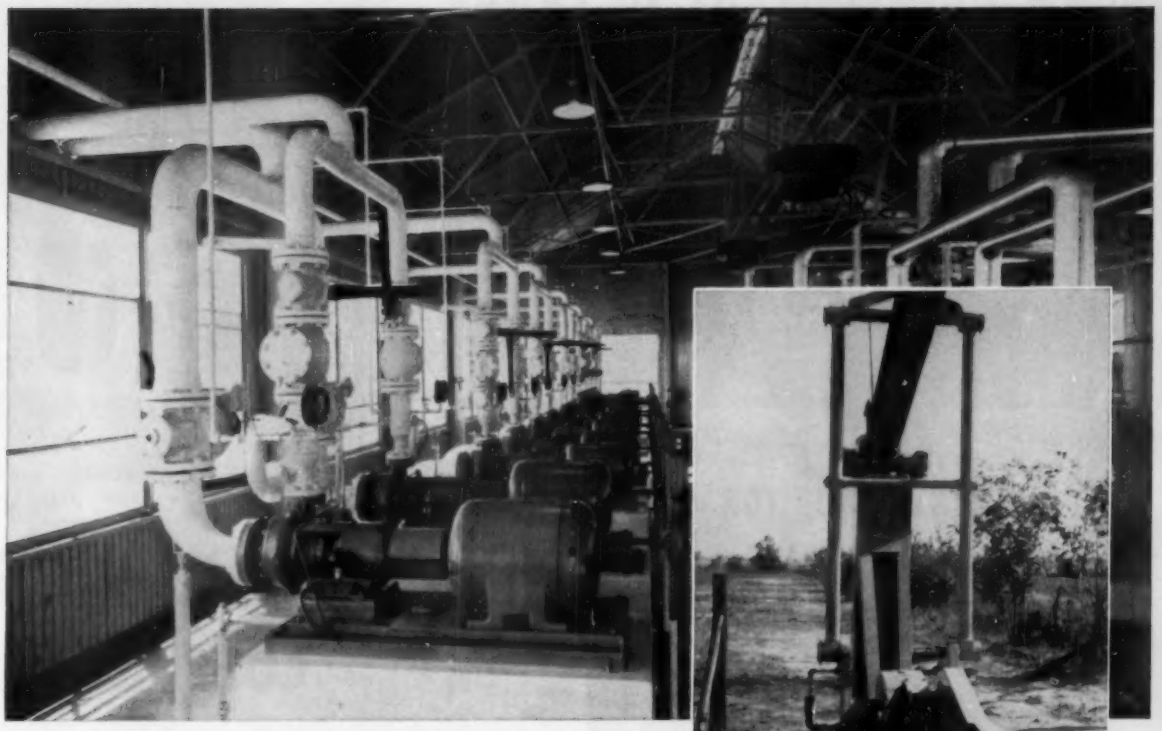
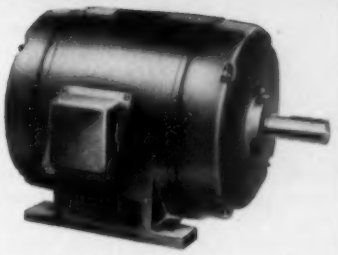


WAGNER Petroleum Industry Motors cut operating costs in *FIELD* and *REFINERY*

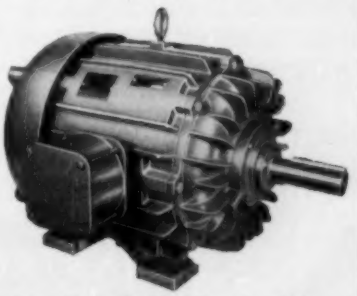
Wagner Type DP and DY Motors are especially designed to meet the load conditions of oil well pumping—to give cost-cutting, year-round, maintenance-free outdoor service. Corrosion-resistant cast iron frames and endplates protect the motor from rain, sand and snow. Conduit boxes are moisture proof and dust-tight. These motors are available for either polyphase or single phase operation. You can get them from stock in your immediate area.

You cut costs when you install Wagner Type JP explosion-proof motors in the refinery because these are built with *extra protection* that means longer motor life: the vital parts of the motor are sealed against dust, fumes, and moisture—the cause of most motor maintenance problems. These motors are approved for Class 1, Group D hazardous locations.

For full information, write for Bulletins MU-224 and MU-137, or phone your nearby Wagner branch office.



Type DP or DY oil well pumping motor. Single phase or polyphase.



Type JP standard totally-enclosed, in ratings through 250 hp; and Type ZP tube ventilated, in ratings through 500 hp.

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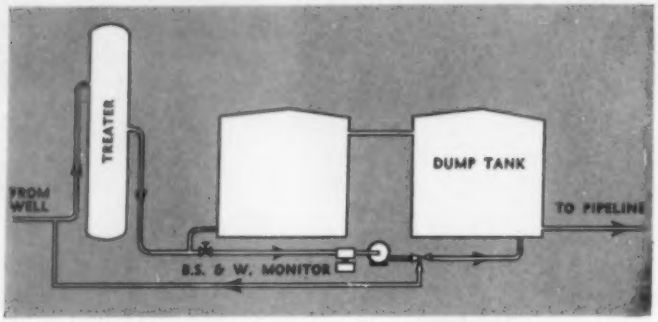
HOW TO MEASURE & CONTROL B.S.&W. CONTENT IN CRUDE AT YOUR LACT INSTALLATIONS



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The B.S.&W. MONITOR is the only instrument meeting the specifications for b.s.&w. control as published in the API bulletin on Automatic Custody Transfer.

The MONITOR continuously inspects b.s.&w. content of crude being delivered from the separator and/or treating equipment to tankage or to the pipeline.

If crude exceeds b.s.&w. specifications, the MONITOR will actuate controls to reroute crude to wet storage or to treaters.

A pilot light labeled "Merchantable Oil" is lit as long as contamination does not exceed settings of MONITOR Limit Dial. When it is exceeded, this light goes out, the "Excess B.S.&W." light goes on and the "Time-Delay" relay is actuated. If delivery of contaminated oil continues longer than Time-Delay setting, the relay actuates to reroute bad oil. A light labeled "Oil By-Passing" remains lit as long as crude is rerouted. When the stream returns to acceptable b.s.&w. content, it is diverted back to line or storage, AUTOMATICALLY.

Percent of crude contamination can be taken at any time.

SPECIFICATIONS: Range — From standard 0-3% b.s.&w. to 0-25%
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Accuracy — 0.1 of 1% water contamination
Power — 110 vac, 60 cps
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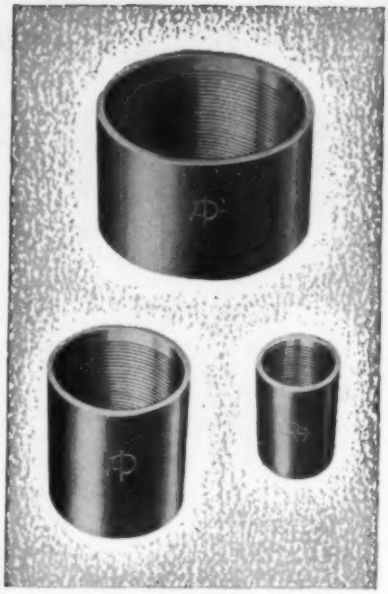

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Rocky Mountain drillers busy in . . .

Utah . . .

Reports from the Paradox basin state that Carter Oil Co. plans at least three wildcats in the area, two of which will dig to Mississippian. Carter got the farmout from United Western Minerals Co. and Fehr & Lyon and associates. The block is 1¾ miles west of Bluff townsite; 3⅛ miles west of the Bluff Bench pool (a two-well producer). The first well will begin in March in 33-40s-21e, San Juan County.

North Dakota . . .

CONFIRMATION is near at a Madison Mississippian discovery in North Dakota. Skelly Oil Co. got 3,481 ft. of gassy oil on drill-stem test at 9,199-9,240 ft. at its 1 Larson in C SW NE 34-152n-96w, McKenzie County.

This well is the southeast offset to the Clear Creek field discovery well which made 218 bbl. of oil daily, 8% water, from perforations in the Madison zone at 9-176-84 ft. Location of the new field is 4 miles west of Blue Buttes.

Wyoming . . .

Triassic Dinwoody is a new-pay for Wyoming's Rolff Lake Phosphoria field in Fremont County. Trigood Oil Co. completed the 1 Tribal in C NW SW 21-6n-3w on pump for 61½ bbl. of oil daily. Production is from perforations at 4,642-64 ft.

This small new-pay discovery is 2 miles northwest of field production itself. The Rolff Lake area has both Curtis and Phosphia production.

San Juan, and . . .

Dual production is reported at Pan American Petroleum Corp. 1-B Randel, extending both the Gallup and Dakota pools at Gallegos field, San Juan County, New Mexico.

The well had an initial potential of 285 bbl. of oil per day on ¾-in. choke from the Gallup at 5,383-5,535 ft. Preliminary gage from the Dakota was 3,204 M.c.f.d. of gas from perforations at 6,250-74 and 6,302-10 ft. Location is 14½ miles south of Bloomfield in SE SW 10-26n-11w.

Sandoval

First Dakota production is reported at a Sandoval County wildcat in northwestern New Mexico. This county's first Dakota Cretaceous producer is Sunray Mid-Continent Oil Co.'s wildcat 5 miles east of Counselor. It flowed 520 M.c.f.d. of gas and 45 bbl. of distillate of 21-hour potential test in the Dakota. Location is SW SW 21-23n-5w, 10 miles south of nearest Dakota production in the San Juan basin.

North Texas gets two Penn strikes

Two Pennsylvanian oil discoveries have been completed in the big Boonsville Bend conglomerate gas field of western Wise and eastern Jack counties, North Texas.

The Texas Co. 1 N. O. Denison, 10 miles southwest of Bridgeport, and the same firm's 1 Fred W. Hall, 1¼ miles to the southeast, both in Wise County, have turned in completion potentials.

No. 1 Denison flowed 150 bbl. of 43° oil a day through 20/64-in. choke, from the Atoka conglomerate at 4,878-5,074 ft. Gas-oil ratio measured 11,900:1. Location is on a 310-acre lease in S. G. Evitts Survey, A-266.

The Texas Co. 1 Fred W. Hall, same survey and abstract, gaged 157 bbl. of 42° oil a day through 24/64-in. choke, from Atoka pay at 4,933-5,112 ft. Gas-oil ratio was 9,650:1.

Texaco has requested discovery allowables for both wells. Suggested new-field designation is Risch, East (Atoka conglomerate). The Atoka (or Bend) is a member of the lower Pennsylvanian.

Kansas strat test finds Penn oil

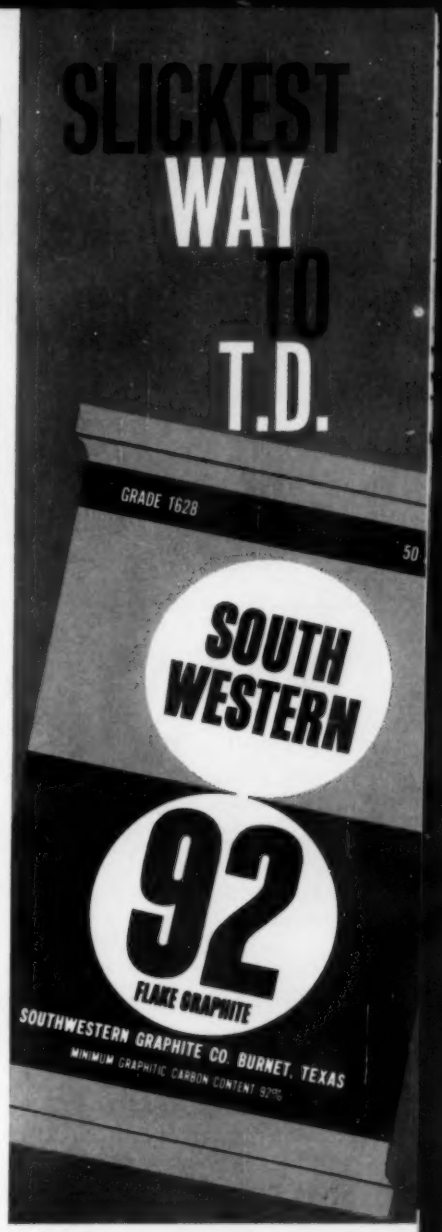
More Pennsylvanian success is reported in extreme northwestern Kansas at another in Phillips Petroleum Co.'s strat test series. The newest addition to this new oil province is the 1 Wilkins, 9 miles north of Bird City in Cheyenne County.

The well, located in C SW NE 16-2s-37w, 23 miles north of Llanos field, recovered 310 ft. of gassy oil, 120 ft. of muddy oil and some gas on drill-stem test in the 4,777-90 ft.

Ohio well extends new Clinton pool

In Ohio, first completed offset to new pool discovery in Section 29, Bristol Township, Morgan County, was confirmed by Virgil Watson on 1 Earl Wilson.

The Clinton was found at 4,519-60 ft. and made 3,160 M.c.f. after fracture with rock pressure of 1,325 psi.



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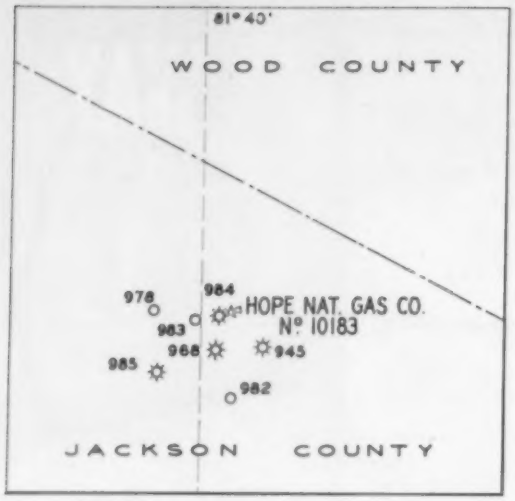

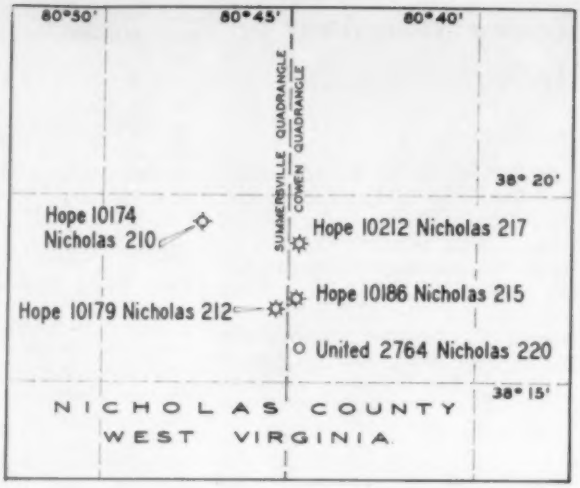

West Virginia gas search livens

In Jackson County . . .

IN WEST VIRGINIA, Hope Natural Gas Co., Clarksburg, has completed 10183 Tennie Bever, an Oriskany test of 4,758-ft. total depth, for an open flow of 5,283 M.c.f.d. after fracture, through 7-in. production string. Twenty-four-hour rock pressure was 1,675 psi.

The well was situated 900 ft. east of Longitude 81° 40', 13,500 ft. north of Latitude 39° 0', Belleville Quadrangle, Grand District, Jackson County.

This is the fourth Oriskany sandstone test completed in this area by Hope. Two are producers from Oriskany, a combined potential for the two wells of 2,055 M.c.f.d. The first test well drilled by Hope was as follows: 10112 H. C. Alexander, drilled to a total depth of 4,714 ft., 39 ft. in the Oriskany, which proved to be dry. The well was plugged back to 4,500 ft. Brown shale, and completed January 1958 for 124 M.c.f.d after shot through 9⅝-in. production string. The well, drilled with rotary, had a 258-hour rock pressure of 910 psi. This well was situated as follows: 3,500 ft. east of Long. 81° 40', and 12,000 ft. north of Lat. 39° 0', Belleville Quadrangle, Grand District, Jackson County.

There are three other test wells drilling in this area as follows: Godfrey L. Cabot, Inc., of Charleston, W. Va., 1492 Frank Pifer, drilling at a depth of 4,145 ft. Krennerman Oil & Gas Co., of Zelienople, Penn., 1 J. M. Powell, drilling at 2,800 ft., and Kewannee Oil & Gas Co., Columbus, Ohio, 1 Gay Moore, drilling at 4,889 ft.

County permit numbers were as follows:

Hope Natural Gas Co. 10112 H. C. Alexander—Jackson No. 945.

Hope Natural Gas Co. 10159 Lizzie Holleron—Jackson No. 968.

Godfrey L. Cabot, Inc. 1492 Frank Pifer—Jackson 978.

Krennerman Oil & Gas Co. 1 J. M. Powell—Jackson No. 982.

Kewannee Oil & Gas Co. 1 Gay Moore—Jackson No. 983.

Hope Natural Gas Co. 10183 Tennie Bever—Jackson No. 984.

Hope Natural Gas Co. 10185 Jackson Co. Bank—Jackson No. 985.

. . . and Nicholas County

SHALLOW PRODUCTION is paying off rich dividends in Nicholas County, West Virginia. Hope Natural Gas Co. of Clarksburg completed its third producer in the county at 10212 Bessie Mays, Nicholas 217. Total depth is 1,829 ft.

An open-flow test made 14,469 M.c.f.d. of gas after fracture through 7-in. production string. Production is from the Blue Monday sand of Mississippian age. This sand is locally

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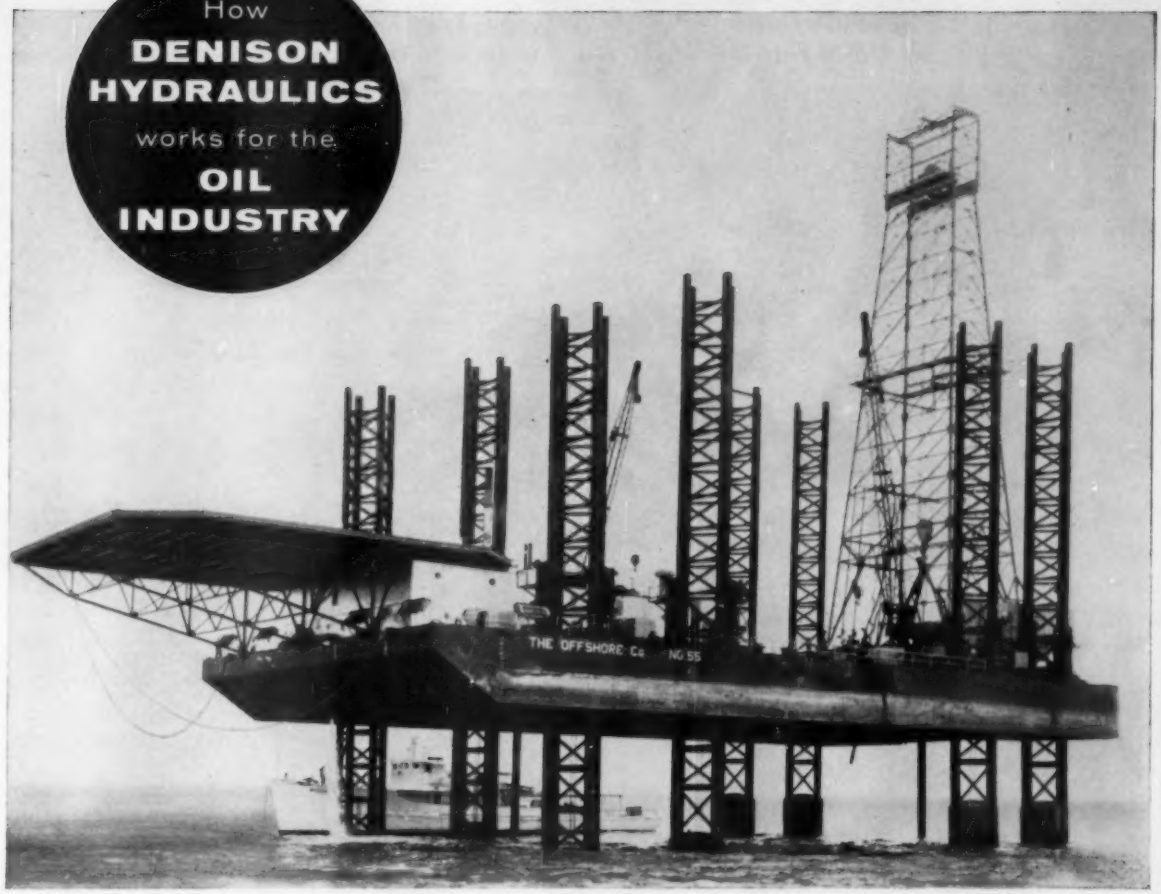

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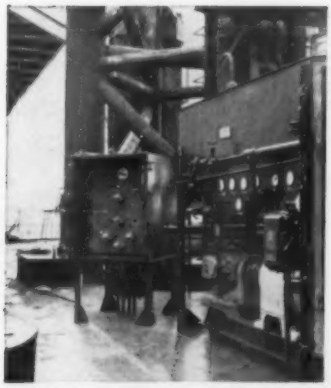

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Utilizing a Series 800, 35 gpm Denison pump at each corner, the hydraulic system developed by DeLong and built to specifications by Denison is capable of actuating lifting jack cylinders separately or in concert as needed. The result is close regulation of the massive 6000-ton load through a system of 16 individual hydraulic jacks on 8 caissons or towers.

Whatever your actuating problem, Denison can help you develop an efficient hydraulic system to do the job dependably and at low cost. Why not consult Denison on your next job. No obligation. Write us. Denison Engineering Division, American Brake Shoe Co., 1176 Dublin Road, Columbus 16, Ohio.

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known as the Edray sand. Rock pressure was 495 psi.

This new producer is located 23,000 ft. west of longitude 80° 40′, and 4,500 ft. south of latitude 38° 20′, Nicholas County, Cowen Quadrangle, Hamilton District.

Hope has drilled four wells in this area. The first was dry. The second was completed for 184 M.c.f.d. of gas natural, and the third for 4,142 M.c.f.d., after fracture. The company has a total potential of 18,795 M.c.f.d. open flow, in the field. Nearest delivery point to the company's pipeline system is about 4½ miles.

United Producing Co., Inc. of Charleston, has staked location for the No. 2764 on Gaymont Fuel Co. Tract G-20. The No. 1 well is 23,000 ft. west of longitude 80° 40′, and 16,500 ft. south of latitude 38° 20′, 11,700 ft. south of Hope's No. 10212 well in Nicholas County, Cowen Quadrangle, Kentucky District.

Discovery wells

OKLAHOMA

Beaver County: Hunt Oil Co. 1 J. R. Anderson, C NE SW 34-1n-20eCM. IP 204 BOPD, 41.2°, 7,416-26 ft., 7,428-39 ft. TD 8,000 ft. New oil field.

Panhandle Eastern Pipe Line Co. et al. 1-3 Miller "C," C NE SW 3-5n-24eCM. IP 240 BOPD, Morrow 6,196-6,201 ft., 6,210-14 ft., 6,230-33 ft., 6,246-49 ft., 6,263-68 ft.; Miss. 6,412-20 ft., 6,424-35 ft. TD 6,543 ft. New dual-pay field.

Champlin Oil & Refining Co. 1 Jike J. Albert, C NE SW 10-5n-26eCM. IP M.M.c.f.d., 154 BOPD, 19 BWPD, Checkerboard Hodges 5,640-43 ft., 5,647-52 ft.; Morrow 6,567-75 ft., 6,592-96 ft., 6,605-12 ft. TD ?. New field in Northwest Knowles area.

Beckham County: Hedgecoke, Smith & Atkinson 1 Jack Denby, NW SW NW 17-8n-22w. IP 45 BOPD, 5 BWPD, 38°, Brown dolomite 1,798-1,817 ft. TD 1,970 ft. New field.

Carter County: Pan American Petroleum Corp. 1 J. D. Nolen, SW SW 12-5s-1e. IP 3,250 M.c.f.d., Springer 8,165-75 ft. TD 8,540 ft. New pay in Ardmore pool.

Cimarron County: The Texas Co. 2 W. D. Youtsler, C SW SE 23-1n-9eCM. IP 8,606 M.c.f.d., Topeka 3,380-96 ft., 3,404-20 ft.; Lansing 3,766-72 ft., 3,832-56 ft., 3,193-20 ft. TD 4,008 ft. New pay in Southeast Griggs field.

Skelly Oil Co. 1 Oklahoma "G," NE NW NE 30-5n-6eCM. IP 240 BOPD, 37.6°, Cherokee 4,099-4,109 ft. TD 4,520 ft. New field.

Cleveland County: Oil Capitol Corp. and Cal-Ray Petroleum Corp. 1 Heckes, C SW NE 2-7n-1w. IP 56 BOPD, 60 BWPD, 38°, dolomite sand 7,419-20 ft. TD 8,200 ft.

Anderson-Prichard Oil Corp. 1 Ball, C NW NE 12-8n-1w. IP 22 BOPD, 38°, upper Bromide sand 6,867-72 ft. TR 7,650 ft. New field.

Creek County: Jet Oil Co. 1 Joe Allen, N½ N½ SW 31-16n-10e. IP 10 BOPD, 35 BWPD, 35°, Dutcher 2,775-95 ft. TD 3,317 ft. New pool.

Ellis County: Pan American 1 Batt Unit, NW SE 32-21n-25w. IP 1,817 M.c.f.d.,

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Morrow 9,974-10,111 ft. TD 10,600 ft. New pool.

Pan American Petroleum Corp. 1 Dave Kellen, Jr., NW SE 14-23n-25w. IP 503 M.c.f.d., Morrow 8,525-74 ft. TD 8,800 ft.

Garfield County: Sunray Mid-Continent Oil Co. 1 Bertha Thompson, C SE NW 15-24n-5w. IP 75 BOPD, 41.4°, first Wilcox 6,349-65 ft. TD 6,461 ft.

Garvin County: Lone Star Producing Co. 1 W. C. Rolling "A," C NW SW 27-1n-1w. IP 17.14 BOPD, Arbuckle 10,065-10,208 ft. TD 15,848 ft.

Champlin et al. 1 E. L. Ray, SW NW NE 31-4n-2e. IP 726 M.c.f.d., first Bromide 3,611-4,800 ft. TD 4,800 ft. Shut-in gas discovery.

Harper County: Calvert Drilling Co. et al. 1 Selman, SE SE NW 8-26n-20w. IP 8,649 M.c.f.d., 12 BOPD, 65 BWPD, Tonkawa 5,020-30 ft., 5,044-52 ft.; Morrow 6,088-97 ft., 6,160-68 ft. TD 6,525 ft. New field.

Hamilton Brothers, Ltd., 1-2 Willie R. Sanders, C SW NE 2-27n-21w. IP 27 BOPD, 42°, Lansing 5,163-67 ft. TD 5,659 ft. New field.

Pan American and Ohio Oil Co. 1 Pile Gas Unit, C SE NW 21-25n-24w. IP 6,700 M.c.f.d., Morrow 7,263-66 ft., 7,269-71 ft., 7,274-78 ft. TD 7,674 ft. New field.

Hughes County: J. A. Chapman 1 Benjamin Reed, SW SW NE 19-7n-9e. IP 2 M.M.c.f.d., Cromwell 3,760-72 ft. TD 3,825 ft. New pay in Southeast Holdenville field.

Kingfisher County: The Texas Co. 1 Ash, SE NW NE 19-17n-5w. IP 292 BOPD, Oswego 6,292-6,312 ft. TD 8,519 ft.

Jones, Shelburne & Pellow Oil Co. 1 J. W. Myers, SW SE 15-18n-7w. IP 200 BOPD, Manning "A" 7,019-29 ft. TD 7,082 ft.

Kiowa County: Gallagher 1 Olin Brown, SE NE NW SE 5-6n-17w. IP 27 BOPD, 33°, limestone 1,038-46 ft. TD 1,081 ft. Extension.

McClain County: Republic Natural Gas Co. 1 Bennett, NW SE NW 21-5n-2w. IP 89 BOPD, Hart 6,904-14 ft. TD 9,013 ft.

Weimer & Fitzhugh 1 Start Unit, C SE SW 18-6n-3w. IP 941 BOPD, 39° to 40°, Hunton 9,772-9,802 ft.; Bromide 10,948-58 ft. TD 11,299 ft. New field.

Petroleum, Inc., 1 Mantooth, C SE SE 12-5n-3w. IP 368 BOPD, 41°, 7,558-70 ft., 7,610-46 ft. TD 8,759 ft. New field.

Gulf Oil Corp. 1 C. E. Bass, C SW NE 36-9n-4w. IP 195 BOPD, 4 BWPD, 42°, Hunton 9,013-43 ft., Tulip Creek 10,236-10,244 ft., 52°. TD 10,775 ft. Discovery.

McIntosh County: Brannan & Farrell and Oklahoma Natural Gas Co. 1 Lackey, SE SE NE 14-12n-16e. IP 48,750 M.c.f.d., basal Atoka 2,246-52 ft. TD 2,252 ft. New field.

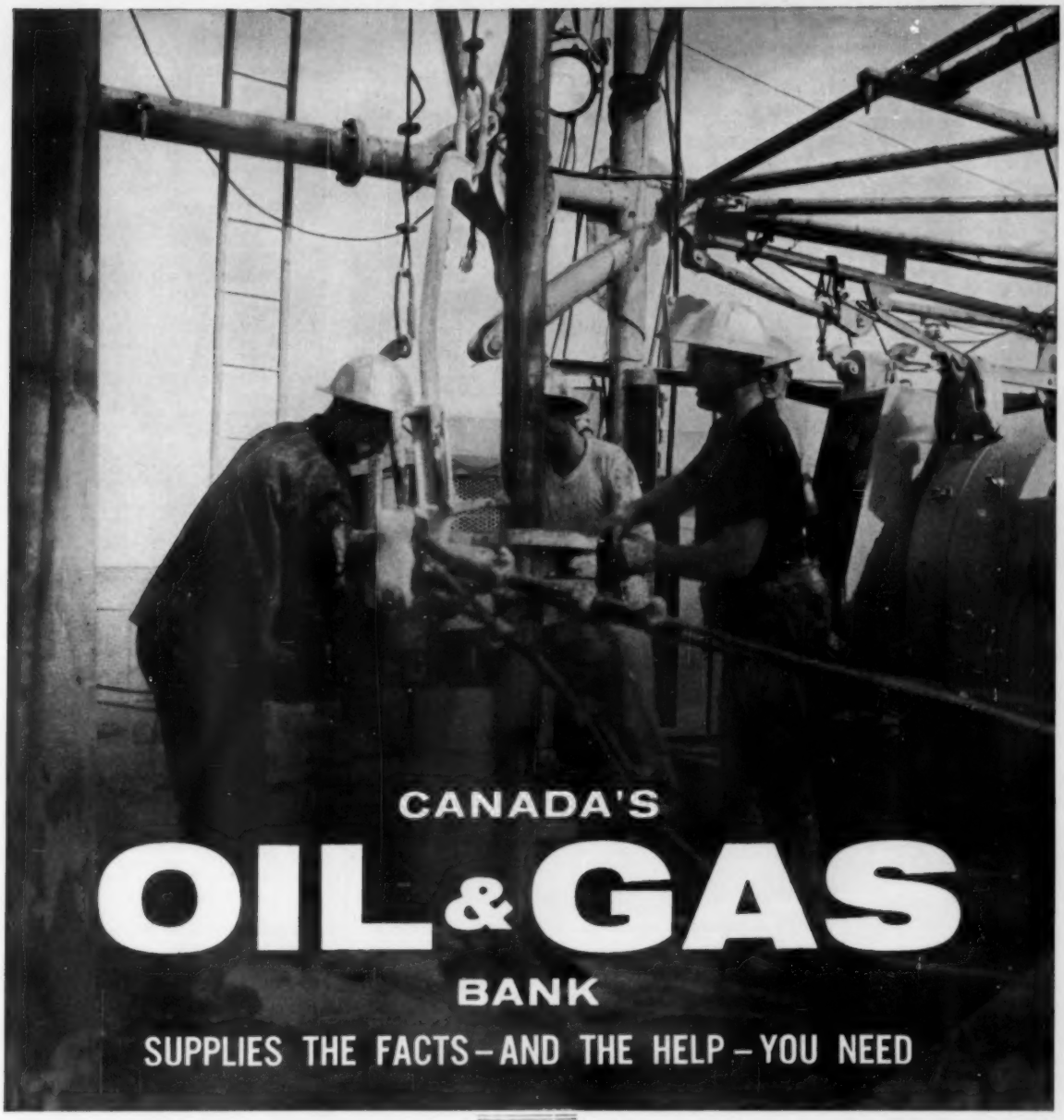
Noble County: Sinclair Oil & Gas Co. 1 Rose Sibley, NE SW NE 9-24n-2w. IP 22 BOPD, 18 BWPD, Mississippi chat 4,518-40 ft., 42°. TD 4,878 ft. New pool.

Okfuskee County: Schermerhorn Oil Corp. 1 Long, SE NE SW 4-10n-9e. IP 192 BOPD, 32°, upper Gilcrease 3,027-33 ft. TD 3,365 ft. New field.

Oklahoma County: Calvert Drilling Co., Inc. et al. 1 Fred Straka, C SW NW 32-11n-3w. IP 8 BOPD, 33°, Bartlesville 7,162-72 ft. TD 7,215 ft.

Okmulgee County: Snee & Eberly 1 Jobe, SW NE NE 35-11n-12e. IP 31 M.c.f.d., Jefferson 3,250-62 ft. TD 4,020 ft.

Osage County: Sands Oil Co. 1 Hall, SE SE SE 27-26n-4e. IP 8 BOPD, 25 BWPD, 37°, Skinner 3,196-3,203 ft. TD 3,370 ft.



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Pottawatomie County: USSRAM Exploration Co. 1 Mary E. Grant, SW NE NE 5-10n-2e. IP 360 BOPD, 33°, unconformity sand 5,568-80 ft. TD 6,215 ft. New pool.

Stephens County: Holliman Drilling Co. 1 Sikes, SE NE NW 13-1s-8w. IP 131 BOPD, 30°, Hoxbar 4,173-85 ft. TD 5,475 ft.

Texas County: Phillips Petroleum Co. 2 Wavia, 17-1n-15eCM. IP 104,500 M.c.f.d., Marmaton 5,756-92 ft., Cherokee 5,922-34 ft.. 5,980-6,010 ft. TD 6,250 ft. New pay in Guymon-Hugoton gas area.

Petroleum, Inc. 1 Steinkuehler, C SE SW 15-5n-11eCM. IP 9,480 M.c.f.d., Cherokee 4,354-58 ft., 4,548-52 ft. TD 5,494 ft. New pay in South Triumph field.

Panhandle Eastern 0-2 Beaty, C SE NW 33-6n-13eCM. IP 68 BOPD, Morrow 6,450-55 ft., 6,460-66 ft. TD 6,749 ft. New field.

SOUTH DAKOTA

Harding County: Herb Clarson 1 Schlaikjer-Government, N¼ SE NW 23-21n-3e. IP 288 BOPD, 34.9°, Red River 8,474-84 ft. TD 8,645 ft. Opens new pool.

SOUTH TEXAS

Hidalgo County: Mokeen Oil Co. and George H. Coates 1 Liberata Hinojosa et al., Share 16, San Ramon Grant, 3 miles east of La Reforma. IP 130 BOPD, trace water, P-34 choke, 43°, TP 800 psi., GOR 473 cu. ft. per barrel, perf. 6,093-98 ft., Frio. TD 8,080 ft. New field—Rico.

WEST TEXAS

Ector County: McCulloch Oil Exploration Co. of California, Inc. 3 McKenzie, 28-45-T2S-T&P Sur., 2 miles northwest of Penwell. IP 110 BOPD, 44°, TP 75 psi., GOR 1,712:1, Denvonian 7,410-94 ft. TD 9,075 ft. New-pay discovery in Penwell field.

Gaines County: El Cinco Production Co. 1 Jones "C", Sec. 22, Blk. A-7, PSL Sur., 28 miles northwest of Seminole. IPP 126 BOPD, 32°, Clear Fork 7,666-7-779 ft. TD 7,820 ft., ground elevation 3,665 ft.

Midland County: Zapata Petroleum Corp. 1 Ida Mae Oldham, 34-37-T1S-T&P Sur., 12 miles northeast of Midland. IP 29 BOPD, 12/64-in. choke, 42°, GOR 1,792:1, TP 275 psi., Strawn 10,288-10,315 ft. TD 11,339 ft., ground elevation 2,697 ft. Completed in September, 1958.

TXL Oil Corp. 1 W. Bryant, 6-38-T4S-T&P Sur., 20 miles southeast of Midland. IP 150 BOPD, 36/64-in. choke, 45°, GOR 4,060:1, TP 100 psi., Pennsylvanian 11,182-96 ft. TD 12,546 ft., ground elevation 2,674 ft.

Ward County: Sinclair Oil & Gas Co. 4 J. B. Tubb, 8-B20-PSL Sur., 8 miles southeast of Monahans. IP 88 M.M.c.f. gas, calculated open flow, Fusselman 6,380-6,442 ft. TD 8,350 ft., PB 6,465 ft. New pay discovery in Crawar field.

WEST CENTRAL TEXAS

Haskell County: Fletcher Oil & Gas Drilling Corp. 1-B Reid, Blk. 25, Red River CSL Sur. 74, 10 miles southeast of O'Brien. IPP 101 BOPD, 36°, GOR 400:1, pay 4,852 ft. TD 4,876 ft.

Palo Pinto County: Coastal States Production Co. 1 Houston, Sec. 39, Blk. 1, T&P Sur., 2 miles south of Palo Pinto. IP 2,100 M.c.f. gas, pay 4,024-28 ft. TD 4,419 ft. Elevation 1,119 ft.

Shackelford County: Wilson Exploration Co. 1 Reams, Sec. 9, BAL Sur., 7 miles east of Albany. IP 56 BOPD, 18/64-in. choke, 37°, GOR 1,040:1, TP 100 psi., Caddo 3,509-14 ft. TD 4,474 ft.

Stephens County: Mid-Tex Gas Co. 1-159 L. B. Turner, J. Stephenson Sur., A-759. IP 5 M.M.c.f. gas, pay not reported. TD 3,900 ft. Old well worked over.

Woodson Oil Co. 1 McDonald-Ryan unit, J. N. Erwin Sur., A-1256, 4½ miles northwest of Ivan. IP 126.6 bbl. oil in 18 hr., 24/64-in. choke, 40°, GOR 400:1, TP 300 psi., Mississippian 4,361-66 ft. TD 4,366 ft.

UTAH

Duchesne County: Continental Oil Co. 3 Ute Tribal, 16-4s-4w. IP 32 BOPD, 21.6°, Green River 2,770-3,070 ft. TD 3,595 ft. New pay in Duchesne field.

San Juan County: Phillips Petroleum Co.-Aztec Oil & Gas Co. 2 Navajo "A", 16-41s-24e. IPF 1,719 BOPD, 41°. TD 5,710 ft. East Desert Creek area.

WYOMING

Crook County: Pan American Petroleum Corp. 1 Lucian H. Robinson, C NW NE 32-50n-67w. IP 294 BOPD, 26.4°, Minnelusa 6,065-80 ft. TD 6,582 ft. Opens Robinson Ranch field.

Fremont County: The California Co. 1 Government, 10-38n-90w. IP 256 BOPD, 6% basic sediment and water, 36°, Wind River-Tertiary 3,171-83 ft., 3,189-3,202 ft., 3,204-10 ft. TD 10,505 ft.

Lincoln County: Belfer Natural Gas Co. 1 Unit, 21-23n-112w. IP 1,881 M.c.f.d., Frontier 10,496-10,506 ft.; 10,510-10,518 ft., 10,538-10,564 ft. TD 11,792 ft. Opens new field.

Sweetwater County: Pubco Petroleum Co. 1-34 Government, SW SW 34-21n 98w. IP 2,550 M.c.f.d., Lewis 4,778-92 ft. TD 5,854 ft. Red Desert basin discovery.

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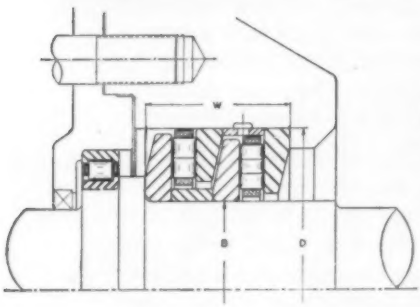

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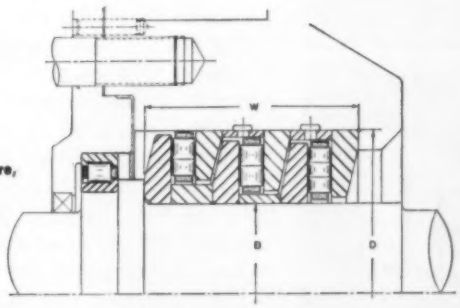

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W. J. Goldston

Depletion Foes Face Barrage

. . . of facts and figures from new head of Mid-Continent Oil and Gas Association. Goldston is ready for attack.

THE NEW president of the Mid-Continent Oil and Gas Association is a transplanted North Carolinian who has succeeded in combining the drilling and producing ends of the oil business—and has made them pay.

William Jerome Goldston, president of the Goldston Oil Corp., Houston, sees a silver lining for the drilling contractor in the months and years ahead. But his reasoning is somewhat different from the expected.

Goldston speaks with some authority because he not only heads a small independent producing company but also a five-rig drilling firm, Goldrus Drilling Co.

What Goldston does to weather the hard times for the drilling contractor is to use his producing company to keep his rigs busy between jobs. And right now they're all at work—four of them on contract jobs and one on a Goldston job.

But what has succeeded for Goldston is no balm for the drilling contractor who has no production and drill sites of his own.

Goldston has no magic solution for the contractor. Rather he sees the problem as one that is gradually working itself out. Equipment, he explains, is gradually wearing out, and many contractors simply are "selling out" by not replacing it.

"When more wears out, conditions will balance out," he says. "When the number of rigs gets in balance with the demand, you will have a sounder business. I think we have the worst behind us."

Meanwhile, Goldston is keeping his own rigs at work by "keeping ourselves flexible."

"We try to hold back our own drilling in an area until we have some free time with our rigs," he says.

His new job . . . Goldston was named president of the Mid-Continent Oil and Gas Association in what may be a crucial year for the industry.

This is the year that antidepletion forces in Congress expect to make a major assault on the 27½% allowance figure.

The association, according to Goldston, has the "facts and figures" to prove the industry's case—"and we won't have to apologize to anybody."

"We will be ready and willing to present our case when the time arrives," he says. "We're not looking for a fight, but if we have one, we will certainly be available."

Goldston has long been active in organizations of the industry. He has previously been vice president of the Texas division of the Mid-Continent association and a director of the main body. He once was Gulf Coast vice president of the Texas Independent Producers and Royalty Owners Association and is a member of the IPAA.

Also, he is a member of the Texas subcommittee of the new Oil Industry Conservation Forum, which is working for wider spacing.

▶▶▶ Personals

How he started . . . Born 50 years ago at Goldston, N. C., a town named for his grandfather, Goldston followed his older brother westward to the oil country.

The brother, Walter L. Goldston, was a geologist in Texas and helped his younger brother get summer work with a geological crew.

Bill Goldston liked what he saw and enrolled at the University of Oklahoma's geology school. After getting his degree in 1929, he worked 2 years as a geologist for Gulf Oil Corp. in East Texas and then had a 3-year fling as an independent producer in Tyler.

The brothers joined forces in 1934 with the Goldston Oil Corp. and stayed together until Walter's death 2 years ago. A third brother, Joseph C. Goldston, also is with the firm as executive vice president and attorney. The company has production in Texas, New Mexico, and Arkansas and is exploring in Alberta and Saskatchewan. Goldrus Drilling has its rigs at work in Texas, Mississippi, and Louisiana.

Personal life . . . Bill Goldston has a full life as a family man, church man, sportsman, and rancher.

He and his wife have one son, two daughters, and one grandchild. He is senior warden in charge of finances for Houston's Christ Church Cathedral (Episcopalian).

One of Goldston's sidelines, which he expects to show a profit, is ranching. He owns 5,000 acres and more than 600 head of cattle at Lake Village, Ark., near Greenville, Miss., and has a smaller ranch with 50 head near Kerrville, Tex.

The oil business has been good to Goldston, and he says today, "I'm glad my brother steered me into it."

If he has any particular philosophy about his calling, it's this: "The only way to survive is to be more efficient—and maybe a little lucky."

●

Dr. A. L. Kidwell has been named section head in the geological division at Jersey Production Research Co.'s Tulsa research center.

Harley N. Hotchkiss, geologist in the petroleum and natural-gas department of the Canadian Bank of Commerce in Calgary, has been named assistant manager and geologist in the department. **Walter George Munch** has been named engineer.

Houston API Group Names Officers

B. O. (Duke) Ellington, third from left, Baker Oil Tools, has been elected 1959 chairman of the Houston chapter of American Petroleum Institute. Other officers are, left to right, Len Williams, Atlantic Refining Co., program chairman; John Bozeman, Dowell division of Dow Chemical Co., secretary; Ellington; James L. Wilson, Atlantic Refining Co., first vice chairman; and J. D. Norton, Hughes Tool Co., entertainment chairman. Not pictured are Darrell Smight, The Texas Co., second vice chairman; A. L. Harrington, National Supply Co., membership; E. J. Slavinski, Gulf Oil Corp., arrangements; and Ed McGhee, The Oil and Gas Journal, publicity.

A. R. Marsden, exploitation engineer with Shell Oil Co., has been transferred to Lafayette, La., from New Orleans.

John H. Atterbury, Jr., senior petroleum engineer with Humble Oil & Refining Co. in Corpus Christi, Tex., has been transferred to Encino, Tex., as district reservoir engineer.

Sam T. Dotson, tool pusher with Big Chief Drilling Co. in Oklahoma City, has been transferred to Big Chief Bolivian Drilling Co. in La Paz, Bolivia.

William P. Gee, president of Texas-U. S. Chemical Co. since its formation in 1954, has been elected vice president in charge of foreign petrochemicals for The Texas Co. Gee joined Texaco in 1927. He was assistant to the president before assignment to Texas-U. S. Chemical, a subsidiary of Texaco and U. S. Rubber Co.

Harold Burrow, executive vice president of Tennessee Gas Transmission Co., has been elected a TGT director. **Charles W. Hamilton,** National Bank of Commerce senior vice president, and **H. Malcolm Lovett,** of the law firm of Baker, Botts, Andrews, and Shepherd, have also been named directors. **A. Dee Simpson,** honorary chairman of National Bank of Commerce, has resigned as a TGT director and will become first director-emeritus of the company. Simpson has been a TGT director for 10 years.

Bill T. Womack, formerly chief geologist for Texas International Sulphur Co. in Houston, has joined Clark Oil & Refining Corp. in Denver as chief geologist.

W. T. Weller, reservoir engineer with Shell Oil Co. in Westwego, La., has been given a temporary assignment at the company's exploration and production research laboratories in Bellaire, Tex.

William L. Johnson, Jr., geophysicist with Bible Geophysical Co., Inc., has been transferred to Houston from Prentiss, Miss.

Samuel W. Harris, maintenance supervisor at Kerr-McGee Oil Industries' Wynnewood, Okla., refinery, has been promoted to refinery manager there. **Bernard A. Paulson,** chief process engineer at the company's Cleveland, Okla., refinery, becomes manager there. **W. S. Royce** will succeed Paulson as chief process engineer at Cleveland.

Howard Blose, head of the manufacturing and fuel products terminalling department at Esso Standard Oil Co.'s Bayonne, N. J., refinery, has been transferred to New York as assistant head of the technical division, manufacturing department. **Dick Preston,** head of the wax division at Bayonne, will succeed Blose as head of the manufacturing department. **John Cordyack** will succeed Preston in the wax division.

Thomas J. Nolan has been transferred by Ohio Oil Co. from Bridgeport, Ill., to Sidney, Neb., as district geologist.

Dave Day, formerly geologist with Superior Oil Co., has joined Kern County Land Co. as geologist in Bakersfield, Calif.

R. T. Weaver, processing engineer with Continental Oil Co., has been transferred to West Lake, La., from Ponca City, Okla.

J. Russell Sherman, former president of Oceanic Oil Co., has been elected a vice president of Lloyd Corp., Ltd., Beverly Hills, Calif.

Virgil McFall, superintendent of Sunray Mid-Continent Oil Co.'s Sarepta, La., gas plant, has been transferred to Purcell, Okla., to head a new gas products plant now under construction near there. The plant is scheduled for July completion.

James Curry, head of Creole Petroleum Corp.'s geological reservoir section at Tia Juana, Venezuela, has been appointed district geologist at Quiriquire. **J. F. Mannion,** head of the Tia Juana industrial-relations group, is moving to Caracas as head of placement and development for industrial relations. He will be succeeded by **Jose Alegrett. Robert Parish,** head of La Salina industrial relations, will return to New York to replace **George Culp,** who is returning to Caracas.

Edward F. Morrill, president of Sohio Chemical Co., has been elected a vice president of Standard Oil Co. (Ohio), the parent company. Morrill joined Ohio Standard in 1932. He was president of Sohio Pipe Line Co. and Mid-Valley Pipeline Co. at one time. He directed construction of Sohio's petrochemical plant at Lima, Ohio, in 1954.

James A. Lewis, president of James A. Lewis Engineering, Inc., and **John W. Rutland, Jr.,** partner in Thompson, Knight, Wright, and Simmons, Dallas law firm, have been elected directors of Republic Natural Gas Co. **Jack R. Fraser,** manager of the company's gas department, has been elected a vice president. Lewis founded Core Laboratories, Inc., in 1935. Since 1947 he has headed Lewis Engineering. Rutland has been counsel for Republic Natural for several years.

▶ ▶ ▶ Personals

H. W. (Duke) Haight has resigned as president of Creole Petroleum Corp. and will join Carter Oil Co. as chairman of the board. **A. T. Proudfit,** a director of Standard Oil Co. (N. J.), will succeed Haight as Creole president. Proudfit was president of Creole from 1945 to 1954 before his election to the Jersey board.

HAIGHT

PROUDFIT

Haight joined Jersey Standard and its affiliates in 1927. He was with Cia. Transcontinental de Petroleo, S.A., a Mexican affiliate, for several years before becoming manager of Standard Oil Co. of Egypt, S.A. He became managing director of the Egyptian company in 1939. Haight joined Creole in 1945 as production manager, and had been president since 1954. **John W. Brice,** Carter president, will continue as chief executive officer of the company. The post of Carter board chairman has been vacant for several years.

J. B. McKee, chief seismograph interpreter for Socony Mobil Oil Co. in Caracas, will leave Venezuela soon for French Equatorial Africa where he will be the company's chief geophysicist in Gabon.

C. L. Kelley, Pan American Petroleum Corp.'s Roswell, N. M., district superintendent, has been transferred to Midland, Tex., as superintendent of the district production office there. He succeeds **F. C. Beleau,** who recently retired.

R. H. Griffin, manager of exploration for Richmond Exploration Co. in Venezuela, has been named assistant to the general manager of The California Co.'s eastern region exploration. He will headquarter in New Orleans. Griffin succeeds **L. F. Adams,** who recently was named Southern California exploration division superintendent for Standard Oil Co. of California, Western Operations, Inc. Also, Calco has appointed **I. B. Murray, Jr.,** division geologist, senior geologist, structures-salt dome. **H. O. Woodbury,** evaluation geologist, has been named senior geologist, stratigrapher. **R. E. Connelly,** senior geologist, has been named division geophysicist, offshore.

Thomas S. Horrocks, general sales manager of Sun Oil Co., has been elected a director. Horrocks has been with the company since 1934.

William J. Robinson, division geophysicist in Jackson, Miss., for Sinclair Oil & Gas Co., has been promoted to staff geophysicist in Tulsa. Robinson joined Sinclair in 1941. He became intermediate geophysicist in 1952 and Jackson division geophysicist in 1954.

Harold E. Christensen, assistant division manager in Denver for The Texas Co., has been elected a vice president of Texas-Zinc Mineral Corp. He will headquarter in Grand Junction, Colo. Texas-Zinc is owned by The Texas Co. and New Jersey Zinc Co.

Keith T. Webb, district geologist for Continental Oil Co.'s CATC marine region in Harvey, La., has been promoted to assistant regional geologist, CATC marine region. He will headquarter in Houston. **Douglas E. White,** Harvey geologist, will succeed Webb there.

Dr. John P. Longwell has been named director of Esso Research & Engineering Co.'s advanced research on superrocket fuels. The company received a government contract for the project last fall. **Dr. John F. Kolfenbach,** head of a basic research group, has been named assistant head of rocket-fuels research.

Dr. N. R. Legge, assistant department head in polymer and chemical applications at Shell Development Co.'s Emeryville, Calif., research center, has been appointed head of the new synthetic-rubber department. **Dr. F. E. Condo,** acting department head in polymer and chemical applications, has been named acting head of the new thermoplastics department.

WOODS

Henry B. Woods, acting director of research for Hughes Tool Co., has been appointed director. Woods had been acting research director since the retirement of **Floyd L. Scott** last August. A graduate of Rice Institute, Woods joined Hughes in 1925. He has served the company as chief chemist, laboratory director, and was assistant director of research until his appointment as acting director.

COWELL

J. R. Cowell, formerly manager of petrochemical sales for Continental Oil Co. in New York, has been named managing director of Continental Oil Co. (Nederland) N.V., a newly formed European subsidiary. The company will promote European sales of Conoco's refined products, particularly petrochemicals and specialty products. Cowell will headquarter in Rotterdam. In addition to Cowell, directors of the company are **Harold G. Osborn,** senior vice president of Continental, Houston; **Dr. John E. Kircher,** executive assistant to the senior vice president, Houston; and **H. P. Solem,** general manager of petrochemical sales, New York.

Dr. R. L. Nelson, district geophysicist at Jackson, Miss., for Pan American Petroleum Corp., has been named Oklahoma City division geophysical supervisor. He succeeds **J. N. Walstrum,** who has retired.

L. D. Fraser, a director of Imperial Oil, Ltd., has been elected a director of Trans Mountain Oil Pipe Line Co. He succeeds **J. K. Jamieson,** who recently resigned to become president of International Petroleum Co., Ltd.

Several Creole Petroleum Corp. employes are moving to Argentina to join the exploration program of Standard Oil Co. (N. J.) affiliates there. Included are **Max Muller,** assistant division manager in Maracaibo; **Jim McCool,** of the Caracas geophysical section; **Harold Copeland,** Maracaibo exploration office; and **G. E. Nowotny,** geophysical section. Also going to Argentina are **Al Stetter,** with Carter Oil Co.'s Tulsa geological department, and **Herbert Sawyer,** Jersey's exploration manager in Cuba. In Venezuela, **William Brown,** former district manager in La Salina, will succeed Muller as assistant Maracaibo division manager. **Nick Garcia** will be the new La Salina manager. **Domingo Casanova** is moving to Lagunillas as the new district manager. He replaces **Joseph Moore,** who is now in New York as Jersey's Western Hemisphere production coordinator. This post had been held by **James Barnett,** the new production coordinator for Europe and North Africa. He replaced **James Clark,** who is retiring.

Personals

William P. Gee, president of Texas-U. S. Chemical Co. since its formation in 1954, has been elected vice president in charge of foreign petrochemicals for The Texas Co. Gee joined Texaco in 1927. He was assistant to the president before assignment to Texas-U. S. Chemical, a subsidiary of Texaco and U. S. Rubber Co.

John J. Rupnik, formerly partner in Rupnik & Ballou, has formed his own geological consulting firm, J. J. Rupnik & Co., Tulsa.

Joseph Harvey, geologist with General Petroleum Corp., has been transferred to Durango, Colo., from Sacramento, Calif.

Kelly H. Roach, corrosion engineer with Superior Oil Co., has been transferred to Lafayette, La., from Houston.

Robert A. Stroud, civil engineer with Tidewater Oil Co., has been transferred to Ventura, Calif., from Los Nietos, Calif.

M. W. Sublett, district supervisor of Sohio Petroleum Co.'s crude-oil purchases and sales department, has joined Permian Oil Co. as Houston representative. **V. E. Schermerhorn, Jr.,** supervisor of transportation and exchanges in St. Louis for Sohio, will succeed Sublett.

Ronald D. Ragland, production engineer with Carter Oil Co., has been transferred to Billings, Mont., from Carmi, Ill.

W. A. Scott, senior exploitation engineer with Shell Oil Co., has been transferred to New York from Denver.

Arthur P. Foster, Jr., The Texas Co.'s West Pampa area engineer in Skellytown, Tex., has been transferred to Dallas as reservoir engineer.

A. H. Masiran, independent operator, has moved his offices from Corpus Christi, Tex., to Sacramento, Calif.

James D. Heldt, vice president of Nebo Oil Co., Inc., Dallas, has been named executive vice president.

Don E. Brauer has been promoted to assistant plant manager at Sinclair Refining Co.'s Sinclair, Wyo., refinery.

C. E. Newell, district superintendent for Continental Oil Co., has moved his headquarters to New Iberia, La., from Abbeville, La. He will take charge of additional territory as a result of the move.

George W. McKinley, vice president in charge of engineering for Hope Natural Gas Co., has been transferred to Consolidated Natural Gas Co., Pittsburgh, the parent company, as director of a new system planning department. He will be in charge of planning involving economic studies, sales forecasts, plant expansion, and gas supply for the Consolidated System.

Thomas A. Heron, Jr., has been promoted from division engineer in Cuero, Tex., to assistant division manager. Heron joined the company as a junior engineer in 1948.

James A. Wallace has been named chief geologist for Arabian American Oil Co. succeeding the late Richard A. Bramkamp. Wallace is on loan to Aramco from Socony Mobil Oil Co., Inc. He will headquarter in Dhahran, Saudia Arabia. **O. A. Seager,** manager of Aramco's exploration and producing department in New York, is moving back to Dhahran to take over his previous job as manager of oil operations. **Donald M. Brown,** who has been holding this position, will move to New York to take over his former job as manager of the exploration and producing department. Wallace joined Mobil Oil Co. of Canada in 1944. He later became Western Canada regional geologist, staff geologist for Saskatchewan, and Central Alberta district geologist. In 1955 he moved to New York as staff geologist for Canada. Since 1956 he has been doing staff work with the company's Middle and Far East interests.

WALLACE

James M. Doss has been named assistant general sales manager, merchandising, for The Texas Co.'s domestic sales department. Doss will be succeeded as central region sales manager in Chicago by **Clifford W. Krueger,** Chicago division sales manager.

Deaths

Roy O. Neal, 64, president of Harley Sales Co., oil-equipment firm, died February 8 at his home in Tulsa. A graduate of the University of Kansas, Neal was chief chemist for Cities Service Oil Co. during World War I. He later was with the old White Oil Corp. and was a partner in Neal Gasoline Co. He helped form the equipment company in 1937.

Ed Prather, 90, pioneer oil man who had a role in the early organization of Humble Oil & Refining Co. and Hughes Tool Co., died February 11 at his Houston home. Prather took stock in Humble in return for his own holdings at the time Humble was founded. He was affiliated with the original Hughes Tool Co. and was a founder of Mission Manufacturing Co. and other business firms.

John C. Watts, Jr., 35, engineering editor of Pipe Line Industry, died February 8 in a Houston hospital of intestinal cancer. Watts was with Humble Pipe Line Co. and had been representative for a pipeline-maintenance contractor before joining the magazine in 1957.

Charles Edward Turner, 83, retired field superintendent for Sinclair Oil & Gas Co., died February 4 in a Tulsa hospital. Turner was with Sinclair 27 years before retiring in 1946.

Ralph D. Brooks, 77, Glenbrook, Nev., oil man, died February 6 in Santa Barbara, Calif., after a heart attack. Brooks helped develop Wyoming's Great Salt Creek area. He was vice president of the old Midwest Refining Co. until its sale to Standard Oil Co. (Ind.) in 1920.

Joseph S. Davis, 83, retired president of Venture Oil Co., Huntington Beach, Calif., died February 6 in Los Angeles.

John Wilbur Carter, 66, California independent oil producer and drilling contractor, died recently in Santa Monica, Calif.

Another Example of Skill With Alloys

Graver's skill with alloys is demonstrated by a long and successful record of fabricating aluminum tank cars for the Union Tank Car Company, North America's largest tank car fleet owner.

Aluminum isn't always the easiest metal to weld. In fact, some of the aluminum alloys are downright pesky at times. But never so much so that Graver can't handle them competently.

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DIVISION—UNION TANK CAR COMPANY
EAST CHICAGO, IND.
Plants and Offices Across America

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Gasoline—the bargain of the year

BY JOHN C. CASPER

GASOLINE PRICES for the year 1958 were the lowest in 40 years, measured in constant-value dollars. And, even this record does not tell the full story. The quality of gasoline has improved so much in the past 40 years that we have no true standards for measuring the full change.

Fuel improvement has paralleled and often led engineering and design changes in automobiles. The motorist can't see and often forgets the quality that refiners have built into gasoline for the modern car. But, the gasoline matches the car and the car has come a long way in design and performance since the days of the Model T.

Gasoline prices shown on the chart are averages of service-station postings for regular gasoline, excluding federal and state excise taxes. These postings are corrected for devaluation of the consumer dollar, using the Consumer Price Index of the United States Department of Labor.

Since the base years for this price index were 1947-49, the prices shown on the chart are the prices a motorist would have paid for housebrand gasoline in 1947-49 consumer dollars.

A quick look at the highlights . . .

	LATEST WEEK	Change from WEEK AGO		Change from YEAR AGO	
Production	7,220,304	UP	101,949	UP	385,333
Crude stocks	259,670,000	UP	1,749,000	DOWN	21,551,000
Completions	852	DOWN	14	DOWN	37
Refinery runs	8,025,000	DOWN	115,000	UP	700,000
Gasoline stocks	199,070,000	UP	1,559,000	DOWN	8,973,000
Kerosine stocks	20,649,000	DOWN	261,000	DOWN	931,000
Distillate stocks	92,018,000	DOWN	4,727,000	DOWN	25,534,000
Residual stocks	55,824,000	DOWN	2,043,000	DOWN	1,803,000
Four-product stocks	367,561,000	DOWN	5,472,000	DOWN	37,241,000
Total imports	1,890,700	DOWN	132,100	UP	652,200

The average price for 1958 on this scale was slightly lower than the other two low points in recent years, one in 1946 and the other in 1952.

In current dollars, the 1958 motorist paid 21.47 cents a gallon for regular gasoline plus a 41.5% sales tax of 8.91 cents a gallon. The total was 30.38 cents a gallon.

In average 1947-49 consumer dollars, he paid 17.4 cents for the gasoline and 7.2 cents tax for a total of 24.6 cents. In dollars of the same value, a gallon of gasoline in 1949 would have cost him 19.9 cents for the fuel and 6.4 cents tax for a total of 26.3 cents.

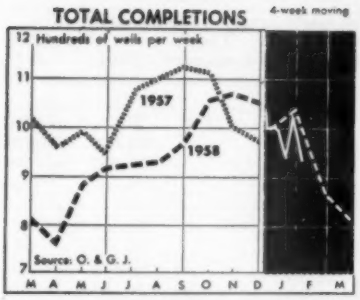
Back in 1934 at the middle of the depression, the motorist paid in current dollars only about 13.6 cents a gallon for gasoline, tax excluded. But dollars were more valuable then. In terms of 1947-49 dollar values, he was paying 23.8 cents for the fuel plus 9.1 cents tax for a total of 32.9 cents, a third more than the average motorist paid in 1958.

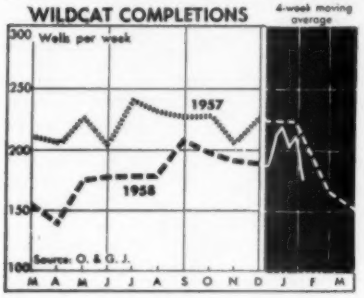
Even in current dollars, gasoline prices were low at the service station and even lower at refineries. Without the tax, 1958 gasoline at the station was 2.8% cheaper than in 1957 and 0.5% cheaper than in 1956. Cargo prices for regular gasoline on the Gulf Coast in 1958 averaged 7.4% below 1957 and 7.1% under 1956.

Without any correction for inflation, the 1958 Gulf Coast cargo price for regular gasoline was lower than it was in 7 out of the preceding years.

In current dollars, the Gulf Coast spot average for 92-octane gasoline was 10.56 cents a gallon. A price of 12.1 cents a gallon would have been needed to equal the average for the past 10 years after correction for inflation. This indicates that Gulf Coast cargo prices for regular gasoline were at least 1.5 cents too low in 1958.

Gasoline prices have strengthened slightly on the Gulf Coast since the first of the year. However, marketers credit the gain to the reduction in runs caused by the strike at the Gulf Oil Corp. refinery. Summer prices will depend on demand and the stock poistion at the end of April.





Active Rotary Rigs*

	2-9-59	2-2-59	2-10-58
Alabama	8	8	10
Arkansas	13	16	16
Arizona	....	....	1
California	70	76	87
Land	67	72	(†)
Offshore	3	4	(†)
Colorado	26	22	36
Florida	1	1	1
Illinois	24	20	37
Indiana	4	4	4
Iowa	3	3	3
Kansas	131	118	124
Kentucky	5	5	2
Louisiana	297	305	326
North	31	36	29
S.-Inland waters	128	132	(‡)
S.-Land	101	101	231
Offshore	37	36	66
Maryland	1	2	....
Michigan	17	11	9
Missouri	....	....	....
Montana	16	16	26
Mississippi	52	55	47
Nebraska	21	25	17
Nevada	....	....	....
New Mexico	97	101	114
New York	....	....	1
North Dakota	28	29	13
Ohio	2	2	2
Oklahoma	202	177	205
Oregon	....	....	....
Pennsylvania	11	11	11
South Dakota	1	1	....
Texas	685	692	773
S.-Inland waters	8	7	(‡)
S.-Land	129	146	164
Offshore	2	1	4
North-East	162	154	(†)
W. Central	250	251	(†)
West	134	133	(†)
Utah	28	28	40
Washington	1	1	....
W. Virginia	2	2	4
Wyoming	49	50	53
Total U.S.	1,795	1,781	1,982
Western Canada	222	215	214
Eastern Canada	....	....	....
Grand total	2,017	1,996	2,196

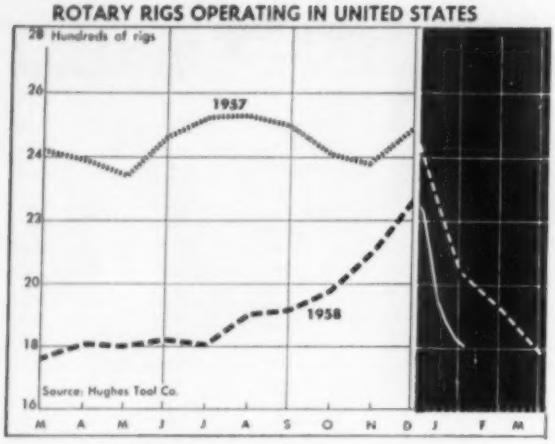
*Hughes Tool Co. †Comparisons not available due to change in method of reporting. ‡Included in South-Land.

WEEKLY WELL COMPLETIONS . . . WEEK ENDED FEBRUARY 7, 1959

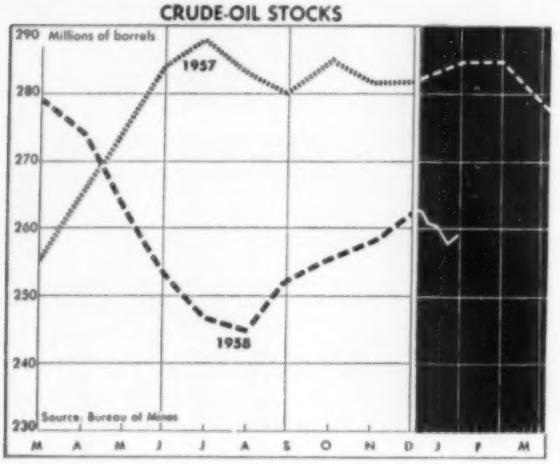
	Total wells							Cum.		Total wildcats					Cum.	
	Total	Crude	Cond.	Gas	Dry	Service	Footage	1959	1958	Total	Crude	Cond.	Gas	Dry	1959	1958
Alabama	0	0	0	0	0	0	0	17	8	0	0	0	0	0	2	4
Arkansas	17	10	0	1	6	0	56,685	113	88	1	0	0	0	1	24	17
California	27	19	0	0	8	0	154,572	183	236	7	1	0	0	6	45	40
Colorado	12	2	0	2	8	0	62,119	84	71	8	0	0	1	7	44	40
Illinois	46	19	0	0	19	8	118,183	280	228	6	0	0	0	6	46	48
Indiana	9	4	0	0	5	0	13,103	75	79	3	0	0	0	3	22	28
Kansas	82	40	0	2	37	3	291,377	484	442	15	3	0	1	11	117	103
Kentucky	15	5	0	0	9	1	17,318	165	115	2	0	0	0	2	14	15
Louisiana	65	30	11	4	20	0	563,942	417	390	12	4	0	3	5	67	49
North	22	12	0	4	6	0	94,879	152	135	8	4	0	3	1	34	23
South	36	15	11	0	10	0	389,959	223	203	4	0	0	0	4	32	23
Offshore	7	3	0	0	4	0	79,104	42	52	0	0	0	0	0	1	3
Michigan	5	3	0	1	1	0	12,896	63	38	0	0	0	0	0	20	14
Mississippi	10	3	0	0	7	0	70,007	87	55	7	2	0	0	5	45	31
Montana	6	3	0	0	3	0	22,300	34	55	2	0	0	0	2	9	31
Nebraska	13	6	0	0	7	0	76,237	72	77	5	0	0	0	5	31	38
New Mexico	37	21	1	8	7	0	145,724	183	288	2	1	0	0	1	20	48
New York	19	12	0	0	0	7	24,572	52	65	0	0	0	0	0	1	5
North Dakota	10	5	0	0	5	0	61,299	49	46	3	0	0	0	3	12	16
Ohio	19	11	0	4	1	3	49,459	85	93	0	0	0	0	0	2	3
Oklahoma	96	48	1	5	41	1	346,762	591	874	16	3	0	1	12	109	133
Pennsylvania	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Texas	332	206	10	9	100	7	1,522,549	2,204	2,225	54	6	2	2	44	426	477
District 1	11	4	1	0	6	0	33,760	168	108	6	1	0	0	5	42	42
District 2	19	7	2	3	7	0	117,654	99	75	7	1	1	2	3	31	19
District 3	27	13	2	0	12	0	202,165	132	157	9	0	1	0	8	42	29
District 4	12	2	0	2	8	0	59,604	160	152	3	0	0	0	3	48	48
East	16	8	0	0	8	0	66,270	125	163	3	0	0	0	3	31	49
District 7-B	37	18	1	0	16	2	124,311	273	259	9	1	0	0	8	81	88
West	118	99	2	0	14	3	594,247	694	664	7	0	0	0	7	75	107
District 9	59	31	0	4	22	2	172,899	393	492	6	3	0	0	3	61	80
District 10	33	24	2	0	7	0	151,639	160	155	4	0	0	0	4	15	15
Utah	3	1	0	1	1	0	21,613	36	48	2	0	0	1	1	10	9
West Virginia	14	1	0	9	3	1	34,290	82	85	0	0	0	0	0	2	1
Wyoming	15	3	0	2	10	0	84,302	95	91	7	0	0	0	7	39	38
Miscellaneous	0	0	0	0	0	0	0	11	17	0	0	0	0	0	8	13
Total U. S.	852	452	23	48	298	31	3,749,309	5,462	5,714	152	20	2	9	121	1,115	1,201
Prev. week	866	456	29	56	307	18	3,702,395	.....	.....	154	12	1	4	137	.....	.....
Cum. 1959	5,462	2,748	147	331	2,094	142	23,328,447	.....	.....	1,115	108	15	40	952	.....	.....
Western Canada	48	25	0	1	22	0	247,213	225	262	19	2	0	0	17	75	79

PRODUCTION

ROTARY RIGS OPERATING IN UNITED STATES



CRUDE-OIL STOCKS



CRUDE-OIL STOCKS BY STATES OF ORIGIN*

(Thousands of barrels)

	1-31-59	1-24-59	2-1-58
Pennsylvania	2,539	2,517	2,941
Other Appalachian	1,597	1,476	1,621
Illinois, Indiana, Michigan	9,675	9,605	11,354
Nebraska and North Dakota	2,132	2,205	2,400
Kansas	9,450	9,522	10,120
Oklahoma	16,551	16,665	19,675
Arkansas	1,956	2,144	2,549
Louisiana	16,948	17,033	20,070
North	3,062	3,059	3,275
South	13,886	13,974	16,795
Mississippi, Alabama, Florida	2,482	2,472	2,631
New Mexico	8,823	9,075	9,564
Texas	115,938	115,171	121,999
East Texas	8,814	8,426	8,954
West Texas	57,132	56,335	53,059
Texas Gulf	19,622	20,258	25,983
Other Texas	30,370	30,152	34,003
Wyoming	13,469	13,553	14,127
Other Rocky Mountain	9,575	9,201	6,607
California	34,485	34,004	36,970
Foreign	†14,050	13,278	18,593
Total	**259,670**	257,921	281,221

*Bureau of Mines. †Includes 4,272,000 bbl. in California.

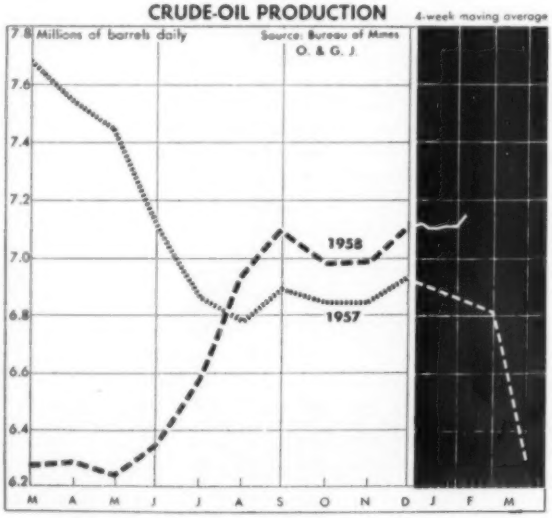
DAILY AVERAGE PRODUCTION FOR WEEK

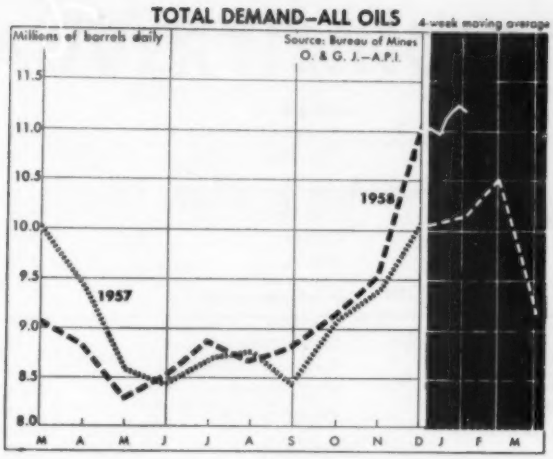
	February 7, 1959			Jan. 31
	Crude oil	Lease condensate	Total	total
Alabama	15,425	.....	15,425	15,415
Arkansas	77,100	150	77,250	77,200
California	848,600	.....	848,600	850,100
Colorado	128,300	.....	128,300	128,000
Eastern	39,100	.....	39,100	39,800
Florida	1,250	.....	1,250	1,200
Illinois	224,200	.....	224,200	219,400
Indiana	32,400	.....	32,400	32,100
Kansas	†329,654	.....	†329,654	†314,890
Kentucky	64,500	.....	64,500	64,500
Louisiana	842,400	100,500	942,900	937,975
North	111,400	4,000	115,400	115,475
South	731,000	96,500	827,500	822,500
Michigan	24,700	.....	24,700	24,700
Mississippi	116,500	5,200	121,700	120,350
Montana	78,600	.....	78,600	78,000
Nebraska	59,400	.....	59,400	59,200
Nevada	100	.....	100	100
New Mexico	284,500	6,100	290,600	281,400
North Dakota	34,800	.....	34,800	38,000
Oklahoma	†580,700	.....	†580,700	†545,900
Texas	2,812,000	70,500	2,882,500	2,846,400
Dist. 1	43,000	2,000	45,000	44,600
Dist. 2	122,000	8,300	130,300	128,500
Dist. 3	386,000	34,000	420,000	416,500
Dist. 4	199,000	8,500	207,500	204,600
Dist. 5	32,000	500	32,500	31,500
Dist. 6	124,000	7,400	131,400	129,400
East Texas Field	162,000	.....	162,000	161,000
Dist. 7-B	144,000	150	144,150	142,150
Dist. 7-C	140,000	3,750	143,750	143,850
Dist. 8	1,145,000	3,000	1,148,000	1,127,800
Dist. 9	208,000	1,900	209,900	211,500
Dist. 10	107,000	1,000	108,000	105,000
Utah	109,400	.....	109,400	110,000
Wyoming	333,900	.....	333,900	333,400
Others	‡325	.....	‡325	‡325
Total U. S.	7,037,854	182,450	**7,220,304**	7,118,355
Change from prev. week, up			**101,949**	
Canada	†505,400	.....	†505,400	†587,800
Total U. S. production—Jan. 1-Feb. 7				271,265,530 bbl.
Same period last year (crude plus cond.)				*260,608,694 bbl.

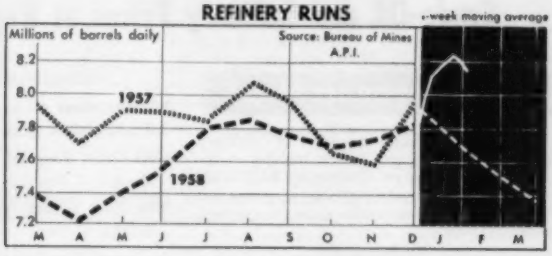
*Includes 6,156,225 bbl. condensate. †Week ended previous Monday. ‡South Dakota, Washington, and Arizona.

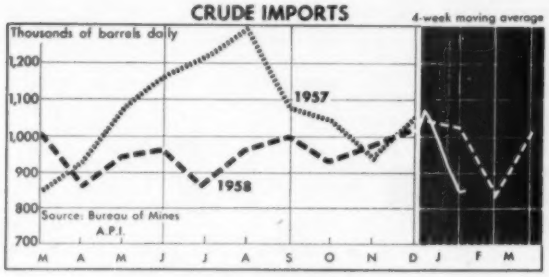
CRUDE-OIL PRODUCTION

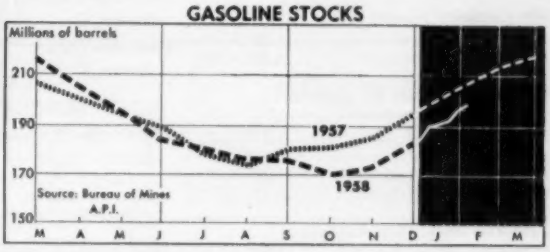
4-week moving average

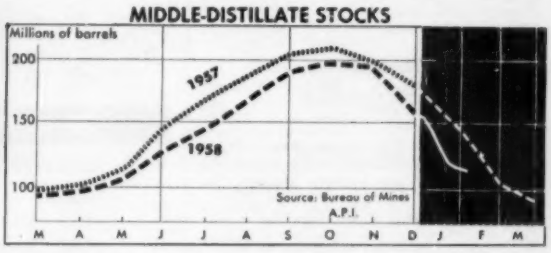


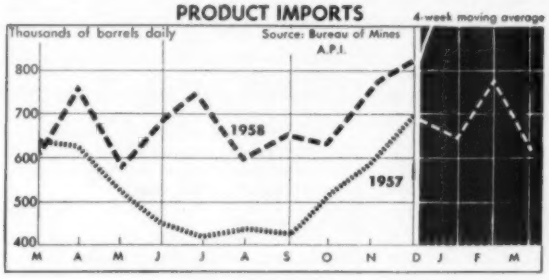


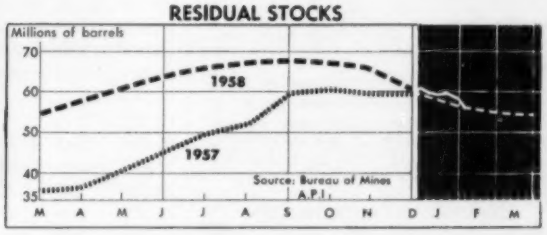












API REFINERY REPORT—FEBRUARY 6, 1959

(Thousands of barrels)

District—	Daily avg. runs	Daily average production—Gaso.*	Kero.	Dist.	Resid.	Stocks‡—Gaso.†	Kero.	Dist.	Resid.	Bureau of Mines, February 1958—Daily avg. runs	Daily average production—Gaso.*	Kero.	Dist.	Resid.
East Coast ...	1,228	516.7	72.7	421.1	156.6	43,048	9,840	32,710	10,509	1,123	474.2	34.9	313.7	187.4
Appalachian:														
District 1 ...	98	41.0	7.0	23.6	12.1	4,755	428	2,249	264	99	40.1	5.6	24.7	10.7
District 2 ...	117	55.4	11.1	14.8	20.3	2,804	306	720	246	110	54.7	6.3	22.9	12.6
Ind., Ill., Ky. ...	1,402	647.0	72.6	367.4	197.9	34,667	3,949	14,092	3,356	1,462	708.0	81.0	347.0	211.5
Minn., Wis., Dak.	106	52.6	5.3	29.4	13.3	6,604	710	4,251	503	108	50.7	7.0	28.4	14.1
Okla., Kans., Mo.	768	396.1	22.3	205.6	32.7	20,014	1,000	8,086	846	724	394.1	20.3	175.1	38.7
Inland Texas ..	301	205.0	7.7	56.0	23.0	8,243	299	1,531	2,183	266	194.8	8.4	53.0	21.1
Tex. Gulf Coast	1,772	836.9	117.8	563.6	183.7	27,638	1,654	9,183	6,014	1,676	864.4	140.5	423.6	196.0
La. Gulf Coast	722	345.1	80.0	196.3	44.4	12,124	1,354	3,679	1,535	597	355.7	63.0	128.4	45.0
N. La. and Ark.	99	43.7	6.3	22.7	4.6	5,491	544	1,600	65	80	31.4	5.0	17.3	8.5
Rocky Mountain:														
New Mexico	24	12.7	0.1	3.4	2.7	674	33	141	32	22	9.1	0.3	4.0	3.2
Other Rky.Mt.	296	134.3	4.9	61.6	35.2	6,192	190	2,483	765	270	134.5	3.4	63.2	35.2
West Coast ...	1,092	558.2	6.9	178.6	239.4	26,816	342	11,293	29,506	987	455.1	4.6	119.3	325.0
Feb. 6, 1959 .	8,025	3,844.7	414.7	2,144.1	965.9	199,070	20,649	92,018	55,824	7,524	3,766.8	380.3	1,720.6	1,109.0
Jan. 30, 1959	8,140	3,930.6	422.4	2,138.9	1,085.7	197,511	20,910	96,745	57,867	.....	.....	.....	.....	.....
Feb. 7, 1958 .	7,325	3,721.1	369.6	1,720.7	1,061.6	208,043	21,580	117,552	57,627	.....	.....	.....	.....	.....

*At refineries including natural blended. †Finished and unfinished. ‡At refineries, bulk terminals, in transit, and in pipelines.

Crude-Oil and Refinery Prices at Representative U. S. and Foreign Points

REFINED-PRODUCT PRICES

Following quotations are for refinery products in cents per gallon moving in interstate shipments on Wednesday each week unless otherwise noted. Crude-oil prices are per barrel at the wells unless otherwise listed.

GASOLINE*

Mid-Continent (Group 3):

Regular (89 octane)	11.25-11.625
Premium (99 octane)	14.25-14.625

Gulf Coast (cargoes for coastwise or export movements):

★ Regular (90 octane)	9.875-10.25
★ Regular (92 octane)	10.125-10.50
★ Premium (97 octane)	11.25-11.625
★ Premium (98 octane)	11.375-11.75

California (rack) (Los Angeles):

Regular (88 octane)	12.00-12.60
Premium (94 octane)	13.00-14.60
Premium (98 octane)	14.00-15.70

Caribbean area (cargoes):

Regular (87 octane)	9.875
Premium (97 octane)	11.625

*Quotations are for octanes shown. Prices usually vary with octane ratings within the regular, premium, and aviation grades.

NATURAL GASOLINE*

Group 3:

Grade 26-70	4.5

Breckenridge:

Grade 26-70	4.0

*If 26-70 natural is considered as 100%, prices for lower-vapor-pressure grades increase 2.5% for each unit drop in Reid vapor pressure down to and including 16 lb. Prices for grades below 16 lb. may vary slightly by areas or plants.

KEROSINE AND DISTILLATE

Mid-Continent (Group 3):

Kerosine 42-44	11.00
Diesel oil (58 d.i. and above)	10.75
Distillate No. 1	10.75
Distillate No. 2	10.00

Gulf Coast (cargoes):

Kerosine 41-43	10.375
Distillate No. 2	9.875

New York Harbor (barges):

Kerosine 41-43	11.50
Distillate No. 2	11.00
Diesel fuel, 48-52 d.i.	11.25

Caribbean area (cargoes):

Distillate No. 2	9.875

WAX (LB.)

Oklahoma (Group 3):

132-135 A.m.p. (semi-refined) in tank car	6.50

New York (export):

126-130 A.m.p. crude-scale (solid in bags or barrels)	7.35

★Denotes change from previous week.

RESIDUAL FUEL (BBL.)

Mid-Continent (Group 3):

Residual fuel (max. 1% S)	$1.95-2.00

Gulf Coast (cargoes):

Bunker C fuel	$2.00

New York Harbor (barges):

Bunker C fuel	$2.37

Caribbean (cargoes):

Bunker C	$2.00

California (rack):

Bunker C fuel, Los Angeles	$2.15

LUBRICATING OILS

Mid-Continent (Group 3):

150-160 bright stock, solvent refined, 0-10 pp., 95 v.i.	23.0
200 vis. neutral oil, solvent refined, 0-10 pp., 95 v.i.	20.5

Pennsylvania Grade:

145-155 vis. at 210, bright stock, 8 color, 25 p.t.	22
200 vis. neutral (180° at 100°), 25 p.t.	21

CRUDE-OIL PRICES

GRAVITY SCHEDULE

	Signal Hill, Calif.	Okla-homa*	Gulf Coast Tex.†	West Tex.‡ N.M.	Wyo. (sour)
14-14.9	$1.86	....	....	....	....
15-15.9	1.95	....	....	....	$1.81
16-16.9	2.04	....	....	....	1.86
17-17.9	2.13	....	....	....	1.91
18-18.9	2.23	....	....	....	1.96
19-19.9	2.32	....	....	....	2.01
20-20.9	2.41	$2.52	....	$2.35	2.06
21-21.9	2.50	2.55	....	2.38	2.11
22-22.9	2.60	2.58	....	2.41	2.16
23-23.9	2.69	2.61	$3.44	2.44	2.21
24-24.9	2.78	2.64	3.46	2.47	2.26
25-25.9	2.84	2.67	3.48	2.50	2.31
26-26.9	2.90	2.70	3.50	2.53	2.36
27-27.9	2.95	2.73	3.52	2.56	2.49
28-28.9	3.01	2.76	3.54	2.59	2.54
29-29.9	3.07	2.79	3.56	2.62	2.59
30-30.9	3.12	2.82	....	2.65	2.63
31-31.9	3.20	2.85	....	2.68	2.67
32-32.9	3.27	2.88	....	2.71	2.71
33-33.9	3.34	2.91	....	2.74	2.75
34-34.9	3.41	2.94	....	2.77	2.79
35-35.9	3.47	2.97	....	2.80	2.83
36-36.9	3.52	3.00	....	2.83	2.87
37-37.9	3.56	3.02	....	2.86	2.89
38-38.9	....	3.04	....	2.89	2.91
39-39.9	....	3.06	....	2.92	2.93
40-40.9	....	3.08	....	2.95	2.95

*Another Oklahoma (sweet) schedule has a top of $3.05 with different gravity variations to $2.34 for below 20°. †Low cold test crude. ‡Sour.

Effective dates of broad changes: California, 1-26-59; East of California, January 3-10, 1957; Pennsylvania Grade 12-22-58.

FLAT PRICES

Louisiana:

Sweet Lake	$3.00
Ville Platte	3.30

Texas:

East Texas	3.25
Conroe	3.53
Van	3.08

Pennsylvania Grade:

Bradford	4.05
Middle District	3.87
Southwest Pennsylvania	3.58
West Virginia	3.40
Buckeye Grade	3.25

Illinois Basin	**3.00**

Canada:

Leduc-Woodbend	2.67
Redwater (Alta.)	2.56
Smiley (Sask.)	2.33
Pembina	2.52

FOREIGN

Venezuela:

★ Cumarebo, 48°-49.9°, Tucupido	3.51
San Joaquin, 41°-41.9°, Puerto La Cruz	3.25
★ Oficina, 35°-35.9°, Puerto La Cruz	2.90
★ Tia Juana medium, 26°-26.9°, Amuay*	2.40
Quiriquire, 16.0°-16.4°, Caripito	2.15
Lagunillas heavy, flat, Las Piedras*	2.10
Bachaquero, flat, 15°-16°, Las Piedras*	1.93

Prices for all crudes of 24° or lighter vary 2 cents per degree change, up or down. All crudes heavier than 24° vary 2.5 cents per half-degree gravity change.

*Also available at La Salina at 3 cents per barrel less.

Middle East, Persian Gulf (cargoes, f.o.b. lifting port):

Arabian, 36.0°-36.9°, Ras Tanura	$2.12
Iranian, 34.0°-34.9°, Bandar Masur	2.04
Iranian, 34.0°-34.9°, Ababan	1.99
Iraq, 35.0°-35.9°, Fao	1.98
Kuwait, 31.0°-31.9°, Mina-al-Ahmadi	1.85
Qatar, 41.0°-41.9°, Umm Said	2.23

Middle East, E. Mediterranean:

Arabian, 36.0°-36.9°, Sidon	2.49
Iraq, 36.0°-36.9°, Tripoli, Banias	2.49

Far East (cargoes, f.o.b. Lutong, Sarawak):

Seria Light, 37°	2.75

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(Latest reported spot fixtures)

★ Gulf-U.S.N.H., clean (USMC +15%)	$3.28
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GR G-FIN Tank Heater, Size 27-2462, Two 12x10x18 Duplex Reciprocating Hot Oil Pumps, Steel Fluid Ends, Howe Propane Compressor, Wittenmeir Hydrogen Compressor. A. R. Motheral, Box 14306, Houston 21, Phone JA 3-2189.

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FOR SALE—Bucyrus-Erie, 36L, good condition. 10" to 4" tools, steel doghouse, lightplant, 100 bbl. water tank, 500 gal. butane tank; White winch truck; 30' tandem float; many extra fishing and drilling tools. Everything goes. Now drilling. Phone 422, Caney, Kansas, after 6:00 P. M.

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Tulsa, Oklahoma.

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OILWELL Model DGE-175 Duplex with accessory equipment. Skid mounted. Two 4¼"x11" double acting cylinders for single stage operation. Waukesha Model 6-NKRU 72 x 8¼" gas engine. Located in Pennsylvania. For price and complete details write

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3—230 H.P. Cooper-Bessemer Type 12 Horizontal Twin Gas Engine Compressors complete. Direct connected to 14½" x 20", 10½" & 6" x 20" compressor cylinders for three stage operation.

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Tulsa, Oklahoma

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Make	No. Available	Model	H.P.	Cyl.	R.P.M.
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Baldwin	3	608	1500	8	650
Baldwin	1	606	1000	6	700
Hamilton	3	68SA	400	6	900
General Motors	2	12-567	1000	12	720

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7. Keystone 74 Trailer Mounted Spudder, 10" to 3" tools.
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9. Used 3½" x 4½" Drill Pipe (Structural use).
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11. Dowdco Diamond Core Barrel, 6⅛" x 50' w/7¾" OD x 4⅜" I.D. diamond bit and tools.

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WANTED TO BUY—Amerada B H P Equipment. State condition, price, and location. Box L-187, The Oil and Gas Journal, Tulsa, Oklahoma.

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No contact will be made with past or present employers without your express permission. Local interviews will be arranged.

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JOHN W. POWERS
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PROCESS ENGINEER

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PETROLEUM ENGINEER: Sales engineering position with progressive new company in Houston. Graduate of recognized petroleum school. Age 28 to 35. General field experience with major in Production and Gas. Some travel. Excellent growth opportunity. Submit detailed resume in confidence. Box L-191, The Oil and Gas Journal, Tulsa, Oklahoma.

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MAINTENANCE ENGINEER to take complete charge of the maintenance department of an expanding 17,000 Bbl./d. modern refinery. Man selected should be a graduate engineer with seven to ten years refinery or petrochemical experience, four years of which should have been in a responsible maintenance or construction position. Send resume to Box L-189, The Oil and Gas Journal, Tulsa, Oklahoma.

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Box L-195, The Oil and Gas Journal, Tulsa, Oklahoma.

SITUATION WANTED

SALES AGENT: Mechanical Engineer with wide chemical processing experience wants to represent manufacturer of processing or mechanical equipment in Tulsa area. Box L-179, The Oil and Gas Journal, Tulsa, Oklahoma.

EXPLORATION GEOLOGIST, 40, family, 11 years experience, 3 majors, 6 years with active Independent, 2 consulting, oil-finding record. Have worked Permian Basin, Panhandle—North and West-Central Texas, 4-Corner, Uinta and Western Kansas. Prefer established, aggressive Independent who rewards success. Box L-172, The Oil and Gas Journal, Tulsa, Oklahoma.

SITUATION WANTED

GEOLOGIST, 30, M.S. 3½ years experience Mid-Continent. Desire position with opportunity for responsibility and advancement. Box L-167, The Oil and Gas Journal, Tulsa, Oklahoma.

REFINERY ACCOUNTANT—Six years refinery experience, 3 years Chief Accountant—light oil and lube. Three years C.P.A. experience. Degree. Age—37. Married. Best references. Box L-169, The Oil and Gas Journal, Tulsa, Oklahoma.

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GEOPHYSICIST, 8 years experience. Last position held Geophysical Supervisor. Foreign experience. Prefer foreign—domestic acceptable. Box L-161, The Oil and Gas Journal, Tulsa, Oklahoma.

ATTORNEY-GRADUATE ENGINEER, 34, desires legal or executive position. Presently employed in oil and gas. Accustomed to high level negotiating. Box L-166, The Oil and Gas Journal, Tulsa, Oklahoma.

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GEOPHYSICIST—twelve years experience as Party Chief and Supervisor. Available now. Box L-186, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOLOGIST, age 47, nine years experience Colombia, Venezuela, Portugal, Egypt; three years Rocky Mountain area. Chiefly regional surface studies. Fluent Spanish, Portuguese. Wide experience in logistics. Desire responsible position preferably aggressive Independent entering foreign exploration. At present in foreign residence. Full resume on request. Box L-201, The Oil and Gas Journal, Tulsa, Oklahoma.

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ATTORNEY, 35, presently employed, Major Oil Company, desires Land or Legal Position. Prefer Tulsa but will consider moving. Write Box L-198, The Oil and Gas Journal, Tulsa, Oklahoma.

FOREIGN ASSIGNMENT desired by drilling superintendent with administrative background, over 20 years continuous foreign experience. Box L-193, The Oil and Gas Journal, Tulsa, Oklahoma.

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BUSINESS OPPORTUNITIES

NEW PRODUCTS WANTED—Well-established, responsible company with complete facilities for developing, manufacturing and marketing oil field equipment is seeking new or improved products, preferably patented or patentable, to add to its presently well-known line. Royalty basis or outright purchase. Initial submission should identify product and general use without revealing engineering and confidential detail. Submissions will be handled promptly and confidentially. Box K-994, The Oil and Gas Journal, Tulsa, Oklahoma.

NEW SERVICES WANTED

Well-established service company with facilities and personnel desires additional services or products to distribute to the oil industry in Lower Texas Gulf Coast.

Box L-177, The Oil and Gas Journal, Tulsa, Oklahoma.

MONEY RAISING

READY TO DRILL 160 acres 800 ft. Peru sand. Good for water flood after flush production. Looks good for small investment. Box 2882, Wichita, Kansas.

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CAPITAL WANTED FOR
BROADWAY SHOW
. . . PROVEN SUCCESS . . .
TOP STAR PRODUCTION
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From $1,000 to $75,000
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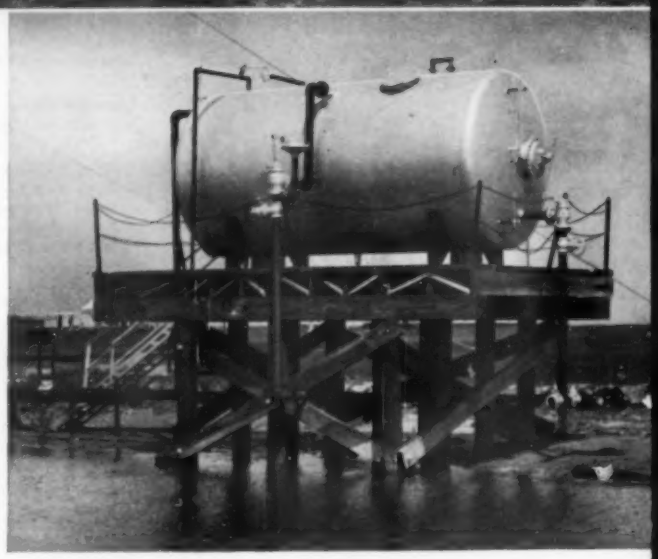

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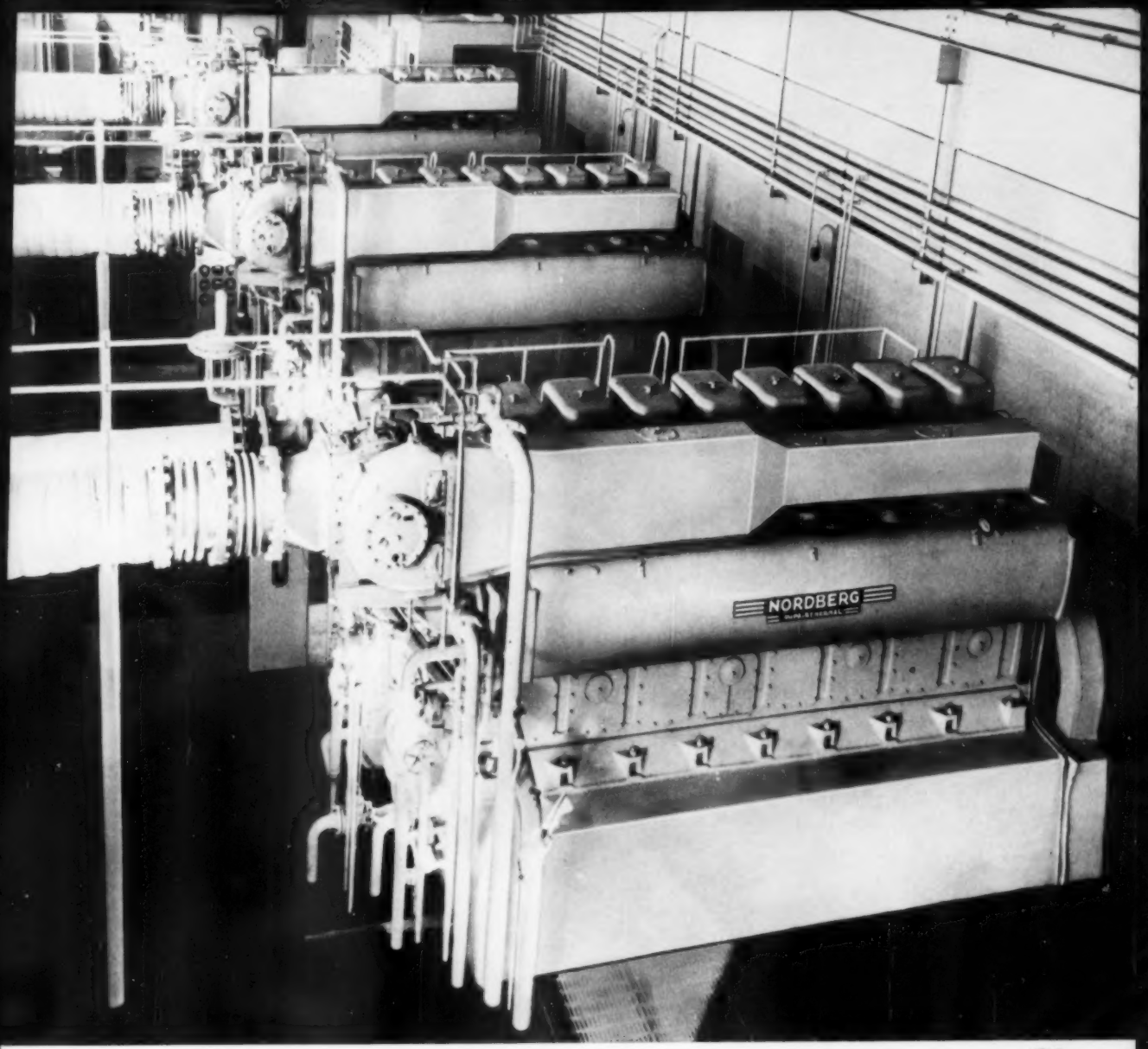

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